SPS-5 Construction Report
PTH No. 1 Westbound
35 Miles East of Winnipeg, Manitoba
Sections 830501 to 830509

Federal Highway Administration
LTPP Division North Central Region

Report Prepared By
Ronald R. Urbach, CET
Benjamin J. Worel, PE
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6875 Washington Avenue South
Minneapolis, MN 55439-0108

June 21, 1996

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Engineers and Scientists Serving the Built and Natural Environments®

June 21, 1996

Mr. Richard C. Ingberg
Regional Engineer
Braun Intertec Corporation
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, MN 55439-0108

Dear Mr. Ingberg:

Enclosed is the Construction Report for the Manitoba SPS-5 project.

If you have any questions about this report please call Ronald Urbach or Benjamin Worel.

Sincerely,

Ronald R. Urbach

Ronald R. Urbach, CET

Benjamin J. Worel, PE

Attachment:
Report

c: Mr. Monte Symons, FHWA
Mr. John Miller, PCS/Law
Mr. Cameron Kruse, Braun Intertec

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SPS-5 Construction Report
PTH No. 1, Westbound Lane
35 Miles East of Winnipeg, Manitoba
Sections 830501 to 830509

1.0 Introduction

The SPS-5 project pertains to the rehabilitation of asphaltic pavements. The primary factors being studied are:

- Degree of surface preparation;
- Overlay materials (recycled or virgin AC mix);
- Overlay thickness consisting of 2 and 4 inches; and
- Climate factors.

The SPS-5 Manitoba was a SHRP pilot project.

1.1 Experimental Cell

The project is in a dry-freeze environmental zone as indicated on the nomination forms. The pavement is in poor condition and built on a fine-grained subgrade soil (sandy silt).

1.2 Summary of Supplemental Sections

There were no supplemental test sections associated with this SPS-5 project. There are two GPS test sections approximately 1.5 miles west of this project. GPS sections 836450 and 836451 were both overlaid during the construction of the SPS-5 project and are now both considered GPS-6B sections.

1.3 Project Location

The project is located on Provincial Trunk Highway (PTH) 1, which is part of the Trans-Canada Highway. Geographically, the site is 53 miles west of the eastern border of Manitoba, 45 miles north of the Minnesota state border, and 35 miles east of the City of Winnipeg. A map of Manitoba is included in Attachment A showing the SPS-5 project location and the other GPS and SPS sections in Manitoba.

1.4 Type of Roadway

The roadway consists of a four-lane divided highway with two lanes in each direction (east and west). The SPS-5 test sections are located in the westbound lanes. LTPP is monitoring the driving lane for this study. Attachment B contains two project layouts for the test section locations built. The first layout was produced by the North Central Region to show (Attachment B1):

- Type of surface preparation;
- Recycled or virgin mix; and
- Thickness of overlay.

The second test section layout supplied by Manitoba Highways and Transportation indicates (Attachment B2):

- Surface preparation;
- Areas that were milled;
- Thickness of overlay;
- Area of recycled asphalt mix; and
- Areas of conventional (virgin) asphalt mix.

The existing roadway on which the SPS-5 was constructed consisted of the following.

- There is a low-fill embankment constructed in 1970. This low-fill embankment resulted in cross sections with 5- to 6-foot ditches.

- The asphaltic concrete pavement was originally constructed in 1971. The construction consisted of the following layers:

Layer Type	Thickness	Material
Asphalt Concrete	4 inches	SC3000
Base	5 inches	3/4" Clay bound crushed granular
Subbase	8 inches	1½" Clay bound screened granular
Subgrade	---------	Sandy Silt (A-4 class)

- The subgrade was imported sandy silt, which is highly frost susceptible. The subgrade had the following characteristics:

  - Average Atterberg (Liquid Limit 19 - Plastic Limit 14 - Plasticity Index 5)
  - Approximately 90 percent of the subgrade passes the #40 sieve.
  - Approximately 42 percent of the subgrade passes the #200 sieve.

- The surface consisted of two 12-foot wide paved lanes with 10-foot gravel shoulders.

- The cross-slope was 2 percent one-way (the original roadway was not built with a crown).

The section descriptions and lift thicknesses were summarized by the Manitoba Highways and Transportation in Attachment C.

1.5 Traffic Characteristics

The traffic data from 1987 includes the following information.

AADT in the westbound direction	1,964
Percent Trucks	14 percent
Estimated annual traffic growth rate	1 percent
Estimated ESALs/year (traffic lane)	120,000

The allowable load limits on this route are the interprovincial Roads and Transportation Association of Canada (RTAC) truck weight standards which were adopted in 1988. These regulations allow the following maximums.

Steering Axle	12,100 pounds
Dual Single Axle	20,000 pounds
Tandem Axle Group	37,400 pounds
Tridem Axle Group	52,800 pounds
Gross Vehicle Weight	138, 000 pounds

1.6 Known Deviations from Guidelines

This project was designated as a pilot project for the SHRP program. The guidelines were still being developed when this project was constructed. The project deviation report is included in Attachment D.

1.7 Geometry

The area is relatively flat and the horizontal alignment is straight. The Broken Head River is located east of the project. There is a crossover at approximately Station 936±. The geometry is shown in the layout included in Attachment B as discussed in Section 1.4.

1.8 Underground Structures within Test Sections

Because of the low-fill embankment, no through-grade culverts or bridges were located within the test sections.

1.9 Installation of Weather Station

No weather station equipment is required for the SPS-5 project. Environmental data is being collected from the existing Canadian weather stations in the area.

1.10 WIM Installation

The WIM is located at approximately Station 828±, approximately 1.5 miles west of the SPS-5 project. The WIM consists of a piezo-style collector with classification loops. Installation was performed by Manitoba in the mid-1980s.

The WIM location contains one non-construction related traffic deviation. Since the project was constructed, there is a gravel mining operation that has been established north of the project. This operation uses the crossover (STA 936±) noted on the project map in Attachment B. The unloaded gravel trucks mostly come from the west (Winnipeg) which travel over the WIM and cut across the divided highway at the cross-over. Once they are

loaded most of the gravel trucks return west towards Winnipeg traveling over the last four test sections and the WIM. The first five sections to the east do not receive the same traffic. Further study should be done with Manitoba to determine the gravel mining trucks effect on this project.

1.11 Schedule for Opening to Traffic

There was no permanent traffic control or lane closures provided at the time of construction. Traffic was placed on the asphaltic concrete overlays a few hours after placement or at the end of the day. The SPS-5 overlays were completed on September 13, 1989.

1.12 General Problems

The contractor for the project did not have any recycling experience. With respect to the recycling situation, the contractor agreed to the following conditions.

1. The drum mix plant would be converted for recycling in accordance to the plans given to the asphalt equipment advisor.

2. Extra mill material from adjacent areas would be taken and a recycling trial project outside of the monitoring area of the SPS-5 project needed to be performed.

1.13 Resident Engineer Information

The overall project management was done by Mr. Ray Van Cauwenberghe.

Ms. Leonnie Kavanagh assisted Mr. Van Cauwenberghe. Ms. Kavanagh was responsible for obtaining the information during construction.

Mr. Dennis Watson assisted in the data collection after the project was completed.

Manitoba Highways and Transportation
215 Garry Street, 12th Floor
Winnipeg, Manitoba R3C 3Z1
Telephone: (204) 945-8982
Fax: (204) 945-2229

The FHWA Regional Engineer for this project is:

Mr. Richard Ingberg
6875 Washington Avenue South
P.O. Box 39108
Minneapolis, Minnesota 55439-0108
Telephone: (612) 942-3066
Fax: (612) 942-3059

1.14 Materials Sampling and Testing

All field materials sampling and testing was performed by personnel of the Manitoba Department of Highways. Representatives from the Manitoba Department of Highways were:

Mr. Jim Johnston
Mr. Stan Hilderman
Mr. Fred Young

Manitoba Highways and Transportation
1188 Portage Avenue (Annex)
Winnipeg, Manitoba R3G 0T3
Telephone: (204) 245-8982
Fax: (204) 945-2229

This was a SHRP SPS-5 pilot project. All asphalt and soil samples were shipped to the SHRP North Central Regional Laboratory testing contractor. Attachment E shows the material sampling locations for both before and after the SPS-5 construction.

1.15 Contractor Information

The contractor was Nelson River Construction, Inc.

Nelson River Construction, Inc.
101 Dawson Road North
Winnipeg, Manitoba
(204) 949-8700

The construction information and daily diary are summarized in Attachment F. This summary was prepared by Manitoba Highways and Transportation.

1.16 Key Construction Equipment

Asphalt Rollers
- Breakdown: Steel vibratory, Bomag BW 220-R
- Intermediate: Nine-wheeled rubber, American Hoist Roll-O-Pactor SP-3000
- Finish: Steel vibratory, Bomag BW 220-R

Haul Trucks
- 7 to 9 Semi-trailer units, 20- to 25-ton capacity each

Asphalt Finisher
- Blaw Know PF 180H

Milling
- Cedar Rapids 1900C

2.0 Project Details

The recycled asphalt pavement (RAP) material for the recycled asphalt mixes consisted of 1 1/2 inches milled material from the existing pavement on four of the test sections. The mixes consisted of 30 percent RAP and 70 percent virgin aggregate.

The original asphalt concrete pavement had a cross-slope of 2 percent one way from left to right (the original roadway was not built with a crown). The overlay will have a crown. See Attachment G which shows the new pavement cross section.

Due to the addition of a crown on the roadway the pavement thickness could be variable. To document the possible variation, additional full-depth cores were taken by personnel from Manitoba Highways and Transportation in 1995. Attachment H is a summary of the thickness of the cores taken.

Attachment I contains the Pre-Construction Activities report presented by Mr. Van Cauwenberghe at a North Central Regional Meeting held in St. Paul, Minnesota, August 24, 1989.

3.0 Initial Performance

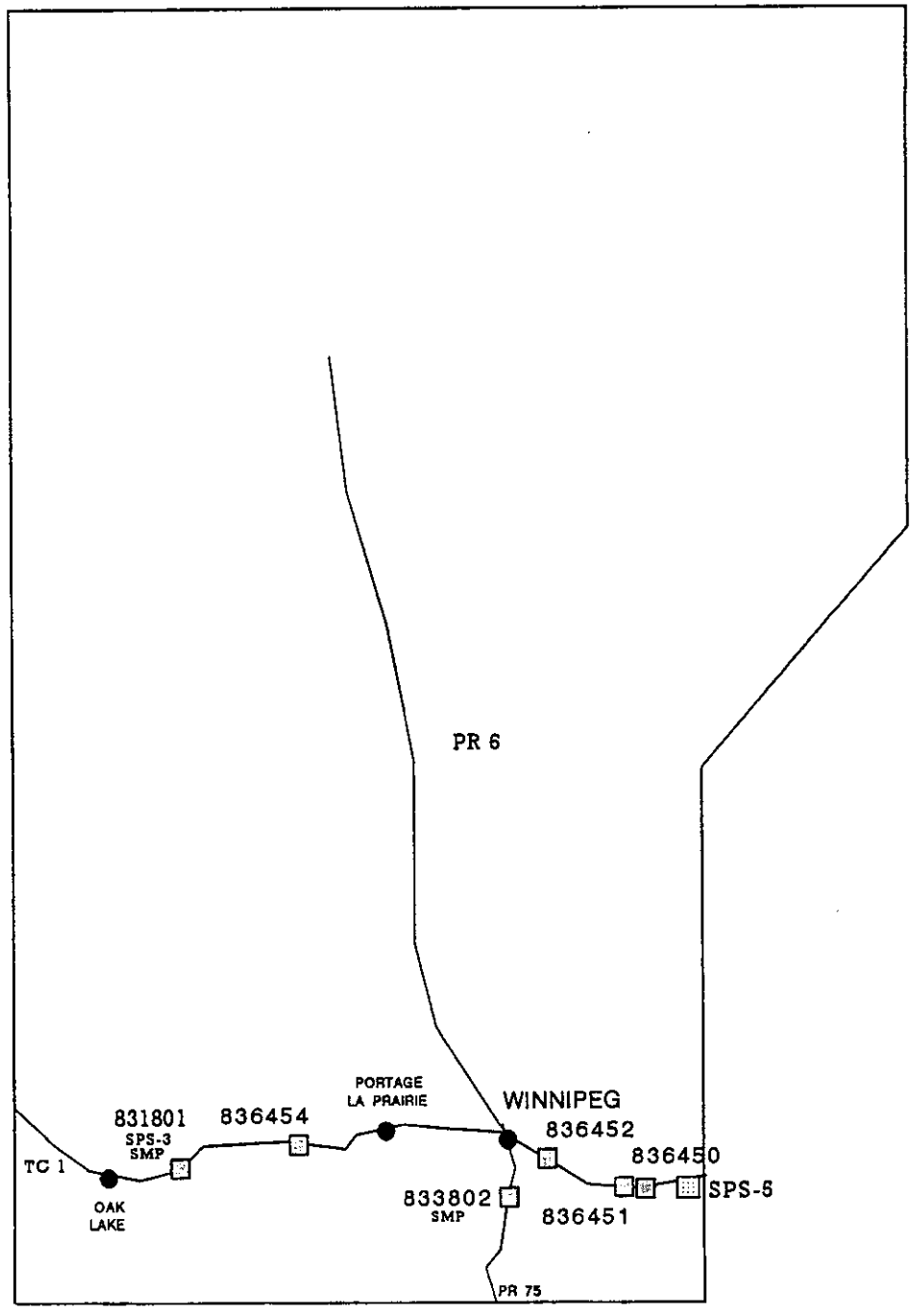
In general, the following initial performance comments pertain to the Manitoba SPS-5 test sections.

- The test sections have performed as expected.
- 830501 will be put (O)ut of Study in 1996 due to a skin patch that will be placed.
- Hairline fatigue cracking is present in the wheelpaths in a number of test sections. This cracking does not seem to depend on any one overlay thickness or treatment type. It may be roller cracking.

Attachment A

Manitoba GPS/SPS Site Location Map

LTPP TEST SITE LOCATIONS
MANITOBA
GENERAL PAVEMENT STUDIES



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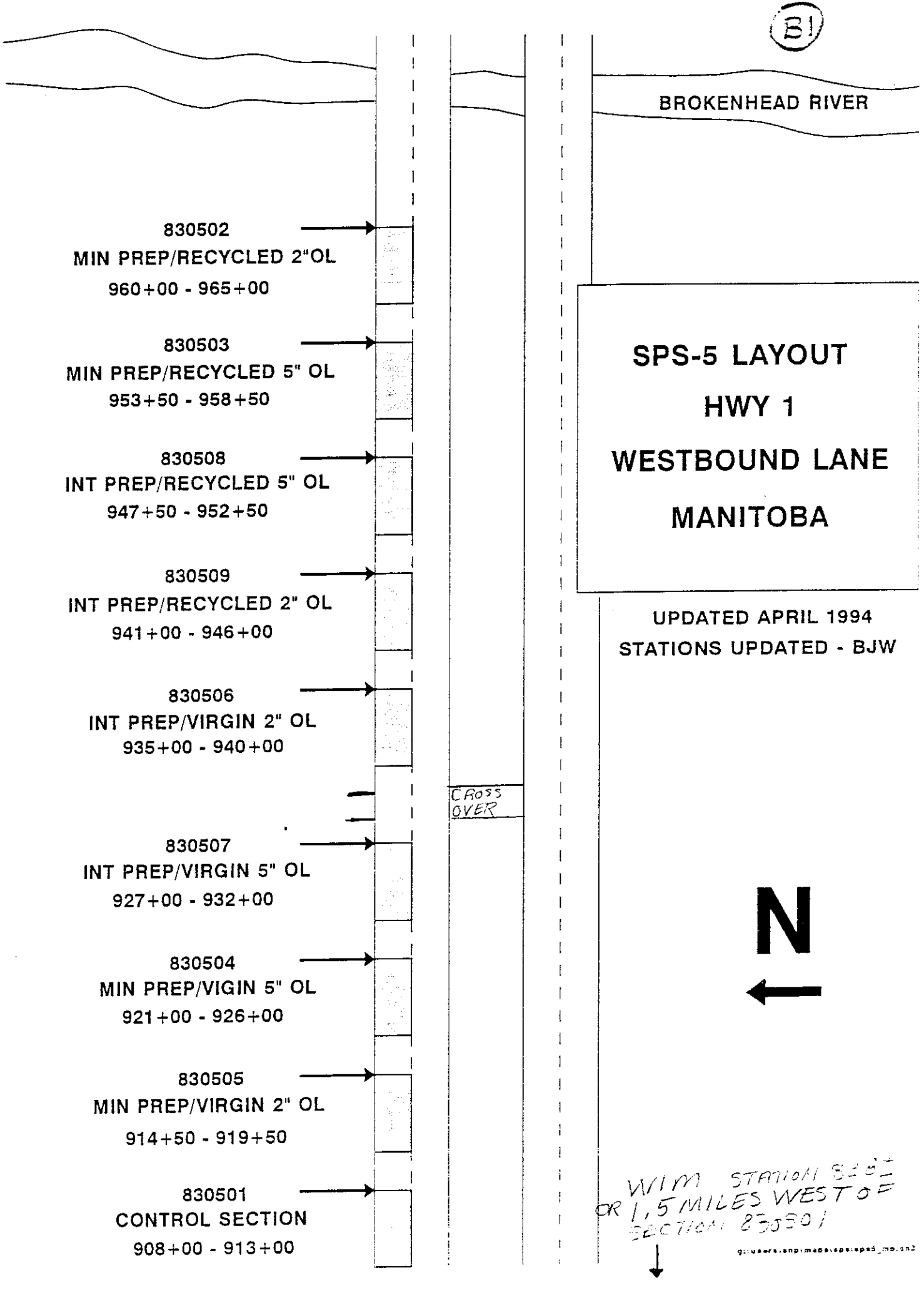
Attachment B

SPS-5 Manitoba Test Section Layout Maps

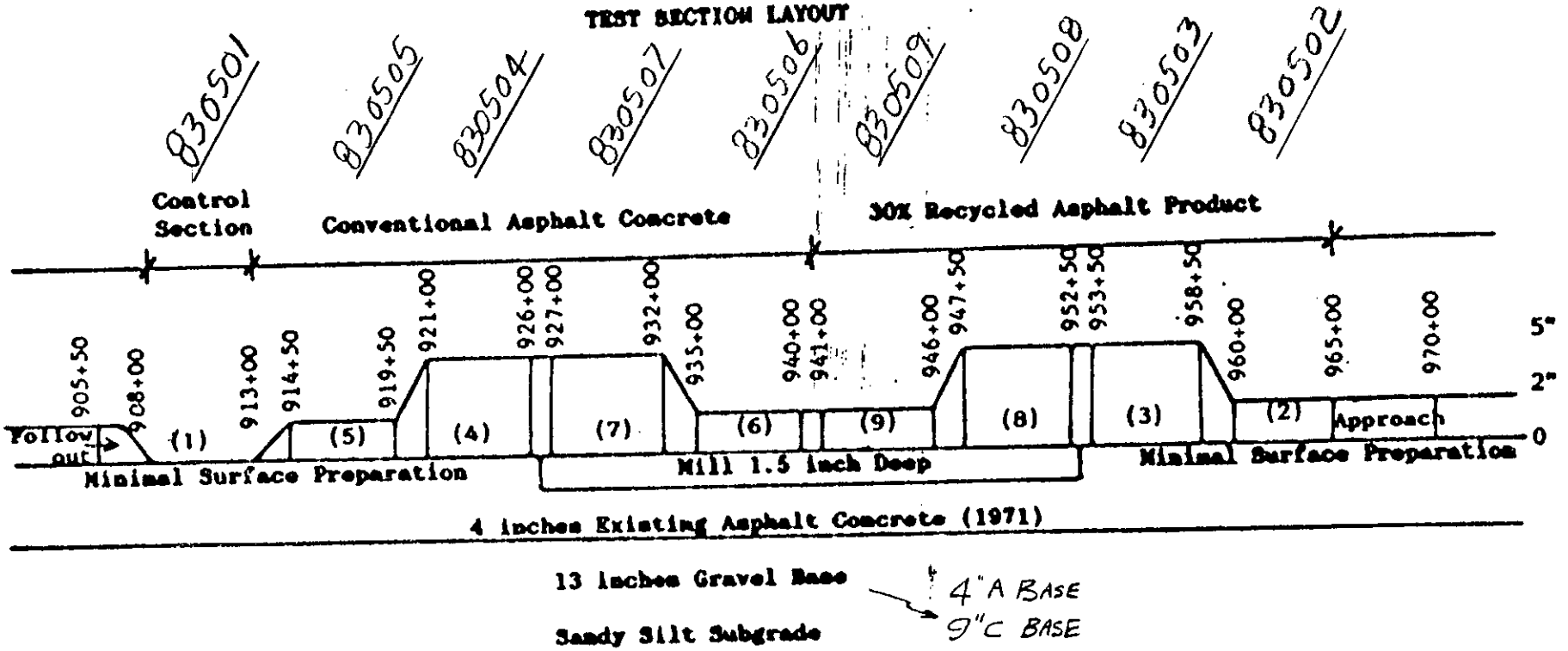

B1
BROKENHEAD RIVER
830502
MIN PREP/RECYCLED 2"OL
960+00 - 965+00
830503
MIN PREP/RECYCLED 5" OL
953+50 - 958+50
830508
INT PREP/RECYCLED 5" OL
947+50 - 952+50
830509
INT PREP/RECYCLED 2" OL
941+00 - 946+00
830506
INT PREP/VIRGIN 2" OL
935+00 - 940+00
CROSS OVER
830507
INT PREP/VIRGIN 5" OL
927+00 - 932+00
830504
MIN PREP/VIGIN 5" OL
921+00 - 926+00
830505
MIN PREP/VIRGIN 2" OL
914+50 - 919+50
830501
CONTROL SECTION
908+00 - 913+00
SPS-5 LAYOUT
HWY 1
WESTBOUND LANE
MANITOBA
UPDATED APRIL 1994
STATIONS UPDATED - BJW
N
WIM STATION SEE OR 1,5 MILES WEST OF SECTION 830501

(82)

PROVINCE OF MANITOBA

SPS - 5

TEST SECTION LAYOUT



	Length (ft)
Test Sections	500
Level Transition	100
Thickness Change Transition	150
Total Test Section	6,460

SHRP IDENTIFICATION NUMBERS:
830501 - 830509

Note: Section Numbers indicated in brackets.

FIGURE 3

Attachment C

SPS-5 Manitoba Construction Locations

SHRP-LTPP EXPERIMENT: SPS-5 & GPS-6B SECTIONS

SECTION DESCRIPTION & LIFT THICKNESS CHART

DATE:23-Aug-89

SECTION DESCRIPTION	STATION NO: ft. x 100	MILL DEPTH in.	BIT OVERLAY LIFT #1 in.	BIT OVERLAY LIFT #2 in.	BIT OVERLAY LIFT #3 in.	TOTAL BIT OVERLAY THICKNESS in.	BIT MATERIAL TYPE	SUBCUT tons	BIT OVERLAY LIFT QUANTITIES #1 tons	#2 tons	#3 tons
SPS-5: begin	970.00				2.5	2.5	RAP				
SECTION 2: begin	965.00				2.5	2.5	RAP				188
SECTION 2: end	960.00				2.5	2.5	RAP				188
transition begin	959.90			0.0	2.5	2.5	RAP				4
	959.25		0.0	1.5	2.5	4.0	RAP			15	24
transition end	958.60		2.0	1.5	2.0	5.5	RAP		19	15	19
SECTION 3: begin	958.50		2.0	1.5	2.0	5.5	RAP		3	2	3
SECTION 3: end	953.50		2.0	1.5	2.0	5.5	RAP		150	113	150
	953.00	1.5	1.5	1.5	2.0	5.0	RAP	11	11	11	15
SECTION 8: begin	952.50	1.5	1.5	1.5	2.0	5.0	RAP	11	11	11	15
SECTION 8: end	947.50	1.5	1.5	1.5	2.0	5.0	RAP	113	113	113	150
transition begin	947.40	1.5	1.5	1.5	2.0	5.0	RAP	2	2	2	3
	946.75	1.5	0.0	1.5	2.0	3.5	RAP	15		15	19
transition end	946.10	1.5		0.0	2.0	2.0	RAP	15			19
SECTION 9: begin	946.00	1.5			2.0	2.0	RAP	2			3
SECTION 9: end	941.00	1.5			2.0	2.0	RAP	113			150
RAP: end	940.50	1.5			2.0	2.0	RAP	11			15
						SUB-TOTALS RAP		293	309	297	965
									TOTAL RAP: tons		1864

Note: ½" Levelling Course (except in milled sections; no levelling)

SECTION DESCRIPTION	STATION NO: ft. x 100	MILL DEPTH in.	BIT OVERLAY LIFT #1 in.	BIT OVERLAY LIFT #2 in.	BIT OVERLAY LIFT #3 in.	TOTAL BIT OVERLAY THICKNESS in.	BIT MATERIAL TYPE	SUBCUT tons	BIT OVERLAY LIFT QUANTITIES #1 tons	#2 tons	#3 tons
VIRGIN: begin	940.50	1.5			2.0	2.0	VIRGIN				
SECTION 6: begin	940.00	1.5			2.0	2.0	VIRGIN	11			15
SECTION 6: end	935.00	1.5			2.0	2.0	VIRGIN	113			150
transition begin	934.75	1.5		0.0	2.0	2.0	VIRGIN	6			8
	933.50	1.5	0.0	1.5	2.0	3.5	VIRGIN	28		28	38
transition end	932.25	1.5	1.5	1.5	2.0	5.0	VIRGIN	28	28	28	38
SECTION 7: begin	932.00	1.5	1.5	1.5	2.0	5.0	VIRGIN	6	6	6	8
SECTION 7: end	927.00	1.5	1.5	1.5	2.0	5.0	VIRGIN	113	113	113	150
	926.50	1.5	1.5	1.5	2.0	5.0	VIRGIN	11	11	11	15
SECTION 4: begin	926.00		2.0	1.5	2.0	5.5	VIRGIN		15	11	15
SECTION 4: end	921.00		2.0	1.5	2.0	5.5	VIRGIN		150	113	150
transition begin	920.90		2.0	1.5	2.0	5.5	VIRGIN		3	2	3
	920.25		0.0	1.5	2.5	4.0	VIRGIN			15	24
transition end	919.60			0.0	2.5	2.5	VIRGIN				24
SECTION 5: begin	919.50				2.5	2.5	VIRGIN				4
SECTION 5: end	914.50				2.5	2.5	VIRGIN				188
transition begin	914.40				2.5	2.5	VIRGIN				4
transition end	913.10				0.0	0.0	VIRGIN				
SECTION 1: begin	913.00				0.0	0.0	VIRGIN				
SECTION 1: end	908.00				0.0	0.0	VIRGIN				
transition begin	907.90				0.0	0.0	VIRGIN				
transition end	906.00				2.0	2.0	VIRGIN				57
SPS-5: end	905.50	1.5			2.0	2.0	VIRGIN	11			15
transition begin	898.90	1.5		0.0	2.0	2.0	VIRGIN	149			198
	897.50	1.5	0.0	1.5	2.0	3.5	VIRGIN	31		31	42
transition end	896.10		2.0	1.5	2.0	5.5	VIRGIN		42	31	42
GPS-6B: begin	896.00		2.0	1.5	2.0	5.5	VIRGIN		3	2	3
CELL 1: begin	891.00		2.0	1.5	2.0	5.5	VIRGIN		150	113	150
CELL 1: end	886.00		2.0	1.5	2.0	5.5	VIRGIN		150	113	150
transition begin	885.75		2.0	1.5	2.0	5.5	VIRGIN		8	6	8
	884.75		0.0	1.5	2.5	4.0	VIRGIN			23	38
transition end	883.75			0.0	2.5	2.5	VIRGIN				38
CELL 2: begin	883.50				2.5	2.5	VIRGIN				9
CELL 2: end	878.50				2.5	2.5	VIRGIN				188
GPS-6B: end	876.00	1.5			2.0	2.0	VIRGIN	56			75
TEST ROAD: END	870.00	1.5			2.0	2.0	VIRGIN	135			180
						SUB-TOTALS VIRGIN		698	679	646	2027
									TOTAL VIRGIN: tons		4050

Attachment D

Project Deviation Report Forms

LTPP SPS Project Deviation Report Project Summary Sheet	State Code Project Code	0	5	8 0	3 0

Project Classification Information

SPS Experiment Number: 05	State or Province: MB
LTPP Region:	☐ North Atlantic ■ North Central ☐ Southern ☐ Western
Climate Zone:	■ Dry-Freeze ☐ Dry-No Freeze ☐ Wet-Freeze ☐ Wet-No Freeze
Subgrade Classification:	■ Fine Grain ☐ Coarse Grain ☐ Active (SPS-8 Only)
Project Experiment Classification Designation (SPS 1, 2 and 8): Not Applicable	
Construction Start Date: August 21, 1989	Construction End Date: September 13, 1989
FHWA Incentive Funds Provided to Agency for this Project:	■ Yes ☐ No

Deviation Summary

Site Location Deviations:	☐ No Deviations ☐ Minor Deviations ■ Significant Deviations
Construction Deviations:	☐ No Deviations ☐ Minor Deviations ■ Significant Deviations

Data Collection and Processing Status Summary

Inventory Data (SPS 5,6,7,9):	■ Complete Submission ☐ Incomplete ☐ Data Not Available
Materials Data:	■ All Scheduled Samples Obtained and Tested ☐ Incomplete/No Test Data
Construction Data:	■ All Required Data Obtained ☐ Incomplete/Missing Data Elements
Historical Traffic Data:	■ All Required Historical Estimates Submitted (SPS 5,6,7,9) ☐ Required Estimates Not Submitted
Traffic Monitoring Equipment:	■ WIM Installed On-Site ☐ AVC Installed On-Site ☐ ATR Installed On-Site ☐ No Equipment Installed
Traffic Monitoring:	☐ Preferred ☐ Continuous ■ Minimum ☐ Below Minimum ☐ Site Related
Traffic Monitoring Data:	■ Monitoring Data Submitted ☐ No Monitoring Data Submitted
FWD Measurements:	■ Preconstruction Tests Performed ☐ Construction Tests Performed ■ Post-construction Tests Performed
Profile Measurements:	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Distress Measurements:	■ Preconstruction Tests Performed ■ Post-Construction Tests Performed
Maint. & Rehab. Data:	■ Complete Submission ☐ Incomplete ☐ Data Not Available
Friction Data:	■ Complete Submission ☐ Incomplete ☐ Data Not Available

Report Status

Materials Sampling and Test Plan:	■ Document Prepared ☐ Final Submitted to FHWA
Construction Report:	■ Document Prepared ☐ Final Submitted to FHWA
AWS: (SPS 1, 2, & 8) Not Applicable	☐ AWS Installed ☐ AWS Installation Report Submitted to FHWA

Preparer Ronald Urbach Date 11/29/95

LTPP SPS-5 Project Deviation Report Site Location Guidelines Deviations	State Code 8 3 Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Site Location Guideline Deviation Comments

A gravel mining operation was started north of the project. Most of the gravel is trucked to the west. The entrance road is about Station 934±. This is about the middle of the project. Sections 830501, 830505, 9830504, 830507, and the WIM have the loaded truck traffic but the rest of the sections do not. See Section 1.10 for more details.

The order of the test sections have had a number of discrepancies over the first couple of months before and after construction. Attachment J contains an order list and a memo which on Page 3 describes part of the problem.

 Preparer Ronald Urbach Date 11/29/95

LTPP SPS-5 Project Deviation Report Data Collection and Materials Sampling and Testing Deviations	State Code 8 3 Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Data Collection and Materials Sampling and Testing Deviation Comments

The SPS-5 Manitoba is a pilot project built in 1989.

The field sampling and testing guidelines were being developed at the time of construction. Due to this the data was not collected to the updated guidelines.

The laboratory testing was done by the North Central Regional lab testing contractor because it was considered a pilot project.

The data collected by Manitoba was collected on Manitoba forms and field diaries during construction. This data was then converted to SHRP forms later once they were accepted to be used.

 Preparer Ronald Urbach Date 11/29/95

LTPP SPS-5 Project Deviation Report
Construction Guidelines Deviations

State Code 8 3
Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Construction Guidelines Deviation Comments

This SPS-5 is a pilot project built in 1989.

Overlay layer thicknesses are quite variable, more than 1 inch on some test sections. This variable thickness may be due to the addition of a centerline crown and the milling operation. Additional asphalt coring was performed in 1995 but did not answer all the questions on the asphalt thickness present.

Preparer Ronald Urbach Date 11/29/95

LTPP SPS-5 Project Deviation Report
Other Deviations

State Code 8 3
Project Code 0 5 0 0

[X] Comments Pertain to All Test Sections on Project

[ ] Comments Pertain Only to Section(s): (Specify) _____

Other Deviation Comments

Project was nominated as a fine-grained subgrade classification but laboratory testing has provided the following information:

Test Pit	Passing 200 Sieve	Station
1	8.9	965+55
2	58.0	913+97
3	46.5	932+39
4	56.9	946+97
5	26.0	958+90

These test results suggest a coarse-grained soil with a large variation which is common in an A-2-4 soil. Note GPS-6B sites had 15-16 percent passing the 200 sieve.

Preparer Benjamin Worel Date 4/17/96

Attachment E

Material Sampling Locations

SPS-5 7-6-89

TRDF Texas Research and Development Foundation A Non-Profit Corporation

TECH MEMO NO: TMEC-19 DATE: June 27, 1989
AUTHOR: Gary Elkins, Waheed Uddin FILE: T-001 (P1-SPS-34)
DISTRIBUTION: Gene Skok, Dick Ingberg, Jim Walls, Amir Hanna
SUBJECT: Material sampling plan for SPS-5 Manitoba project

Enclosed are tables and figures which present the recommended material sampling plan for the SPS-5 site in Manitoba. This plan was prepared based on the information provided to us in the May 26, 1989 memo from Braun Pavement Technologies. Adjustments may be necessary in the field based on site specific considerations. This plan contains what we feel is the minimum to meet the materials characterization needs for the SPS-5 experiment. The other guidelines for test section numbering, test section marking, before and after monitoring measurements, materials sampling during construction, etc. as contained in the report on Sampling, Testing and Monitoring Activities, SPS-5 in Yazoo County Mississippi, June 1989, should be followed for the other data collection activities at this site. The before and after material sampling plans contained in this memo should be used in place of those contained in the document prepared for Mississippi. We are currently preparing a complete report revised specifically for the Manitoba site. This report should be completed in the near future.

The following tables and figures are attached to this memo:

Table 1. Summary of sampling area locations and sampling plan.
Figure 1. Overall layout of sampling areas.
Figures 2 - 12. Details of pre-construction sampling.
Figures 13-23. Details of post-construction sampling.

The field material sampling and testing activities should be performed in accordance with SHRP directives for sampling and testing of GPS test sections.

6811 Kenilworth Ave., Suite 230 • Riverdale, Maryland 20737 • (301) 779-2505 • FAX 1-301-779-2507

Table 1. Summary of sampling area locations and sampling plan for SPS-5 pavement site in Manitoba.

Sampling Area	Direction Station	SAMPLING BEFORE OVERLAY PLACEMENT: AC Pavement Cores	Granular Base Samples	Subgrade Soil Samples	SAMPLING AFTER OVERLAY: AC Overlay Cores
S1	W/907+60	A1, BA1	BA1	A1, BA1	-
+S2	W/914+10	C1-C9, A2, BA2	BA2	A2, BA2	C1 - C12
S3	E/920+70	-	-	-	C13
S4	W/926+70	-	-	-	-
S5	E/932+40	C14-C22, A3, BA3	BA3	A3, BA3	C14 - C25
S6	W/934+70	-	-	-	C26
S7	E/940+60	-	-	-	C27
+S8	W/947+10	C28-C36, A4	TP	A4, TP	C28 - C39
S9	E/952+80	-	-	-	-
S10	E/958+90	C40-C48, A5	BA5	A5, BA5	C40 - C51
S11	E/965+50	-	-	-	C52
TOTAL CORES/SAMPLES					
* C-Type Cores		36	-	-	52
A-Type Cores/Samples		5	-	5	-
BA-Type Cores/Samples		4	4	4	-
Test Pit Samples		1	1	1	-
* Includes					
Extra C-Type Cores:		9	-	-	12

+ Shoulder Auger probes (AP1 and AP2) in sampling areas S2 and S8.

SPS-5 LAYOUT, WEST BOUND HIGHWAY 1, MANITOBA

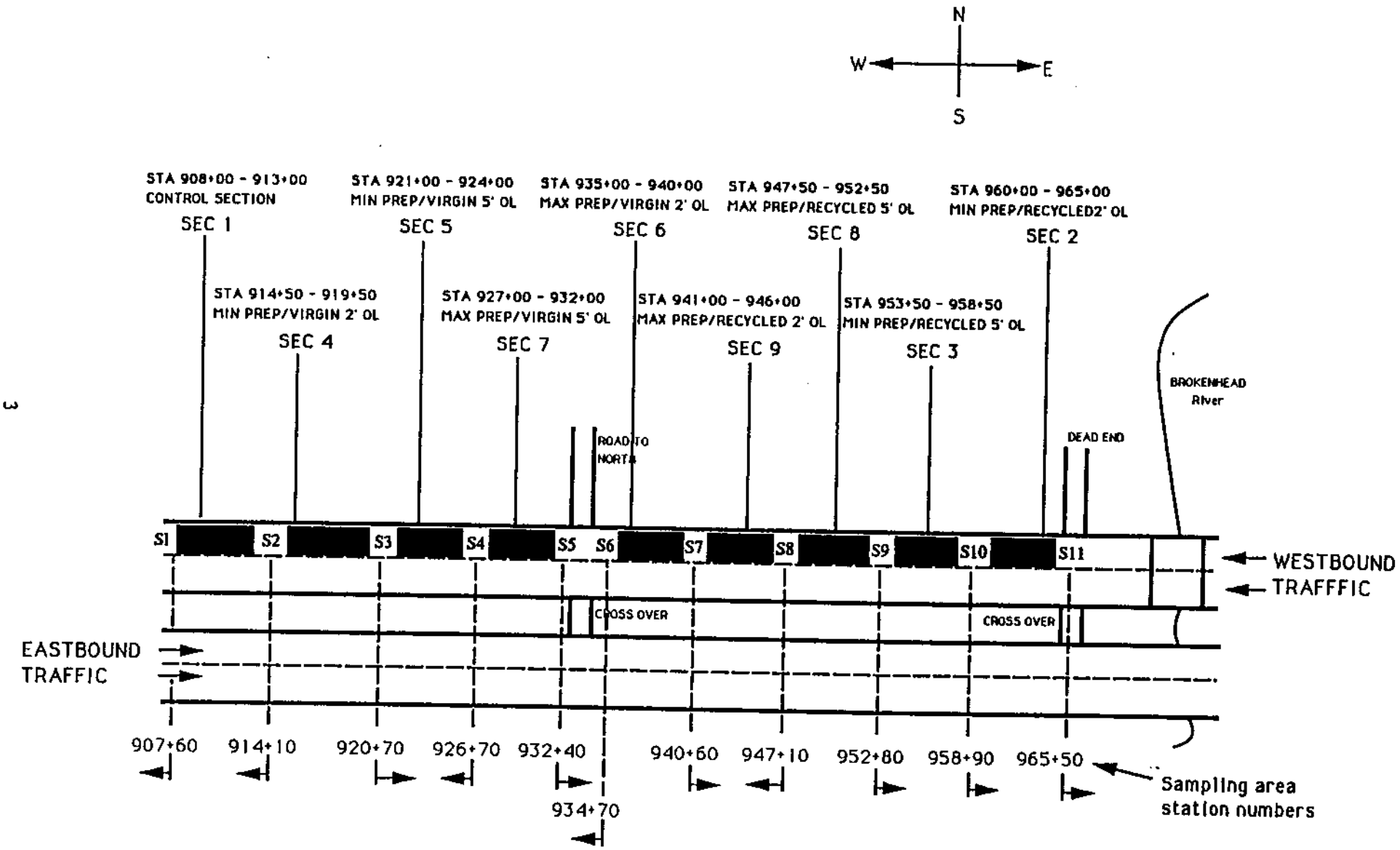
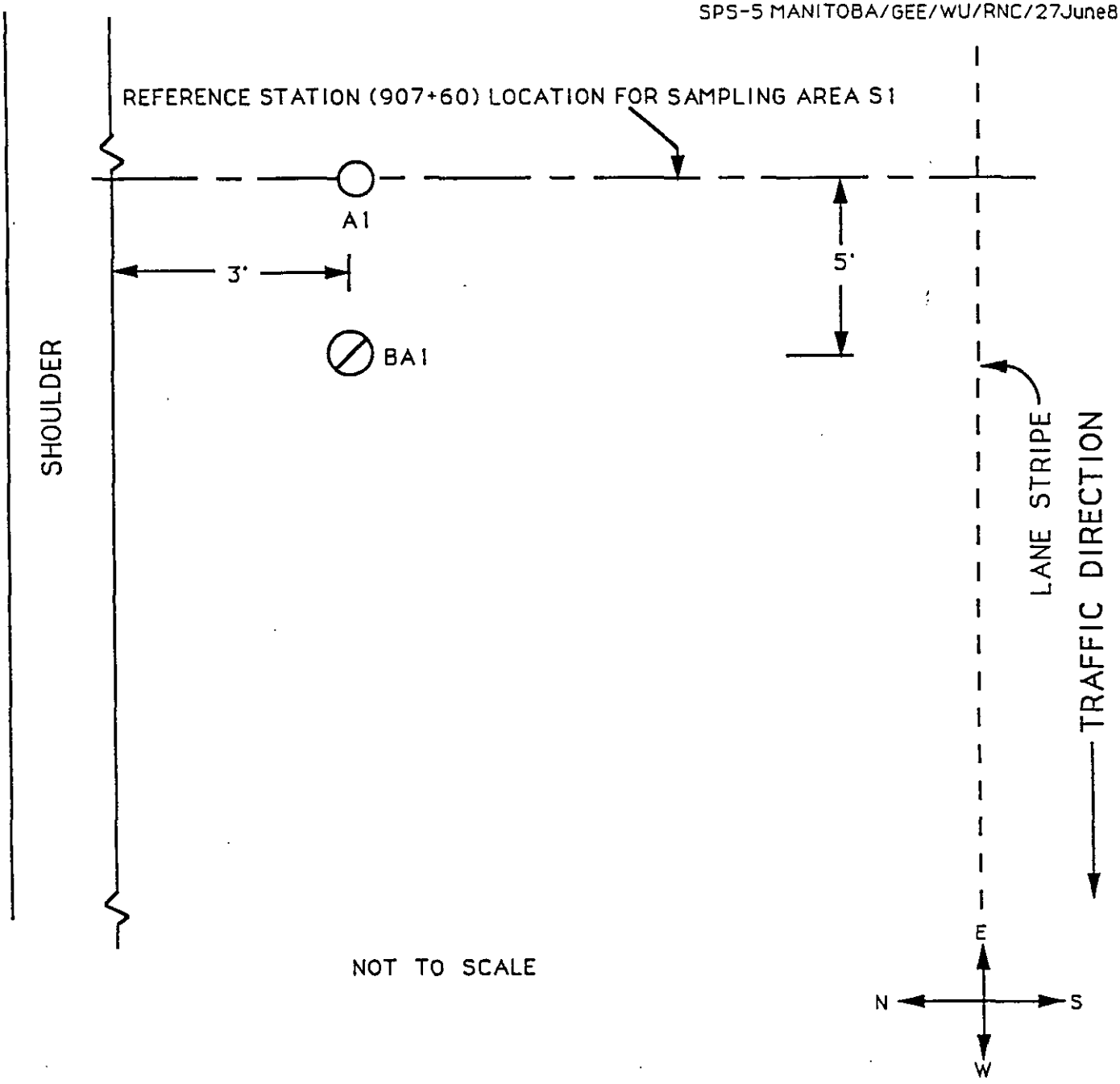


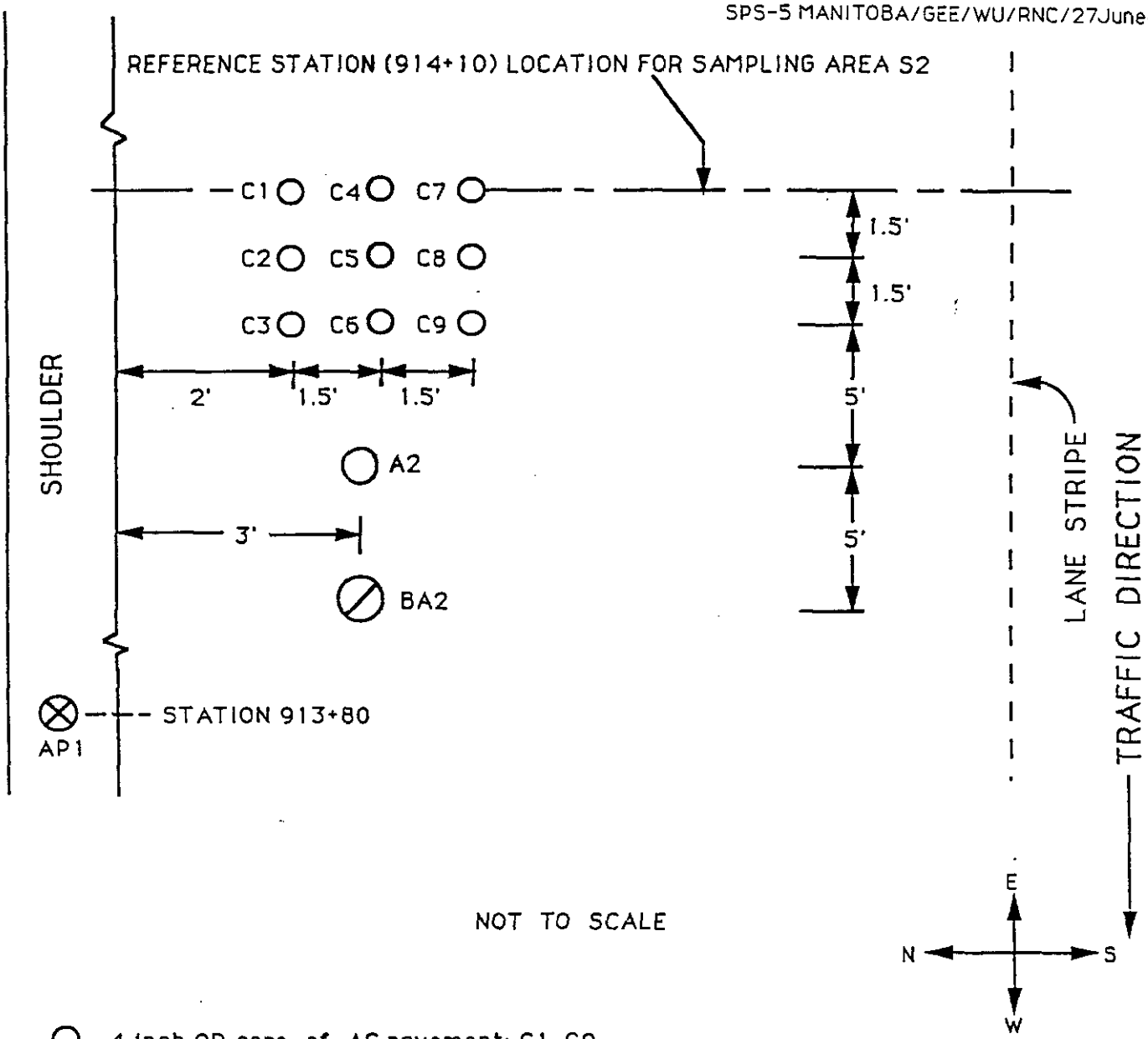
Figure 1. Schematic layout of test sections for SPS-5, Manitoba showing locations S1 through S11 of in-place sampling areas.



○ 6 inch OD core through AC pavement surface; augering of granular base; thin-walled tube sampling and/or splitspoon sampling of subgrade to a depth 5 feet below top of subgrade, as directed by SHRP authorized representative: A1.

⊘ 12 inch OD core of AC pavement surface; augering of granular base and subgrade to a depth of 12 inches below top of subgrade for bulk sample retrieval: BA1.

Figure 2. Before overlay sampling plan for station 907+60 before section 1. Sampling area S1.



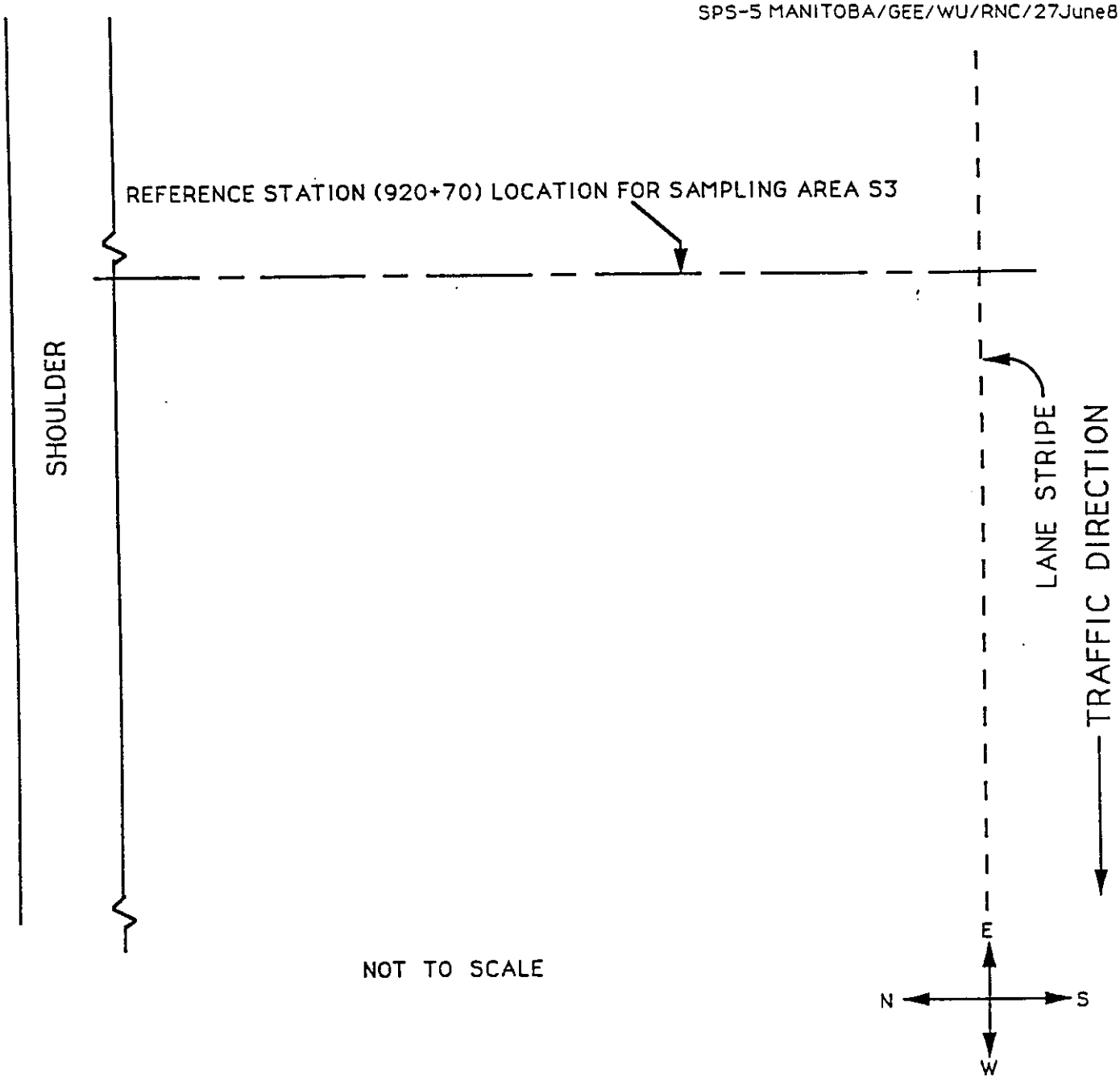
○ 4 inch OD core of AC pavement: C1-C9.

◯ 6 inch OD core through AC pavement surface; augering of granular base; thin-walled tube sampling and/or splitspoon sampling of subgrade to a depth 5 feet below top of subgrade, as directed by SHRP authorized representative: A2.

⊘ 12 inch OD core of AC pavement surface; augering of granular base and subgrade to a depth of 12 inches below top of subgrade for bulk sample retrieval: BA2.

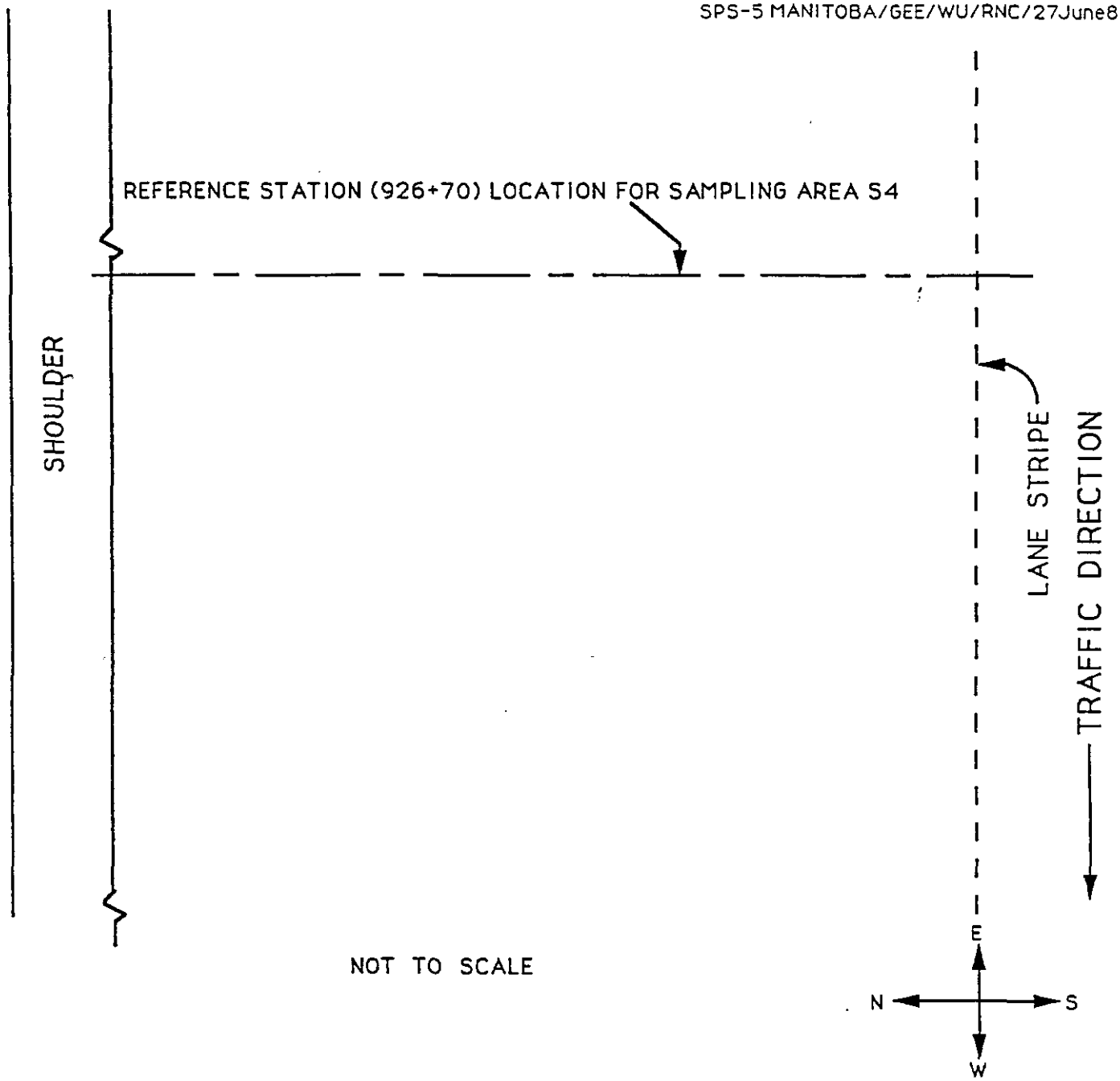
⊗ 4 inch or 6 inch OD auger probe through shoulder to a maximum depth of 20 feet or until refusal is encountered: AP1.

Figure 3. Before overlay sampling plan for station 914+10 before section 4. Sampling area S2.



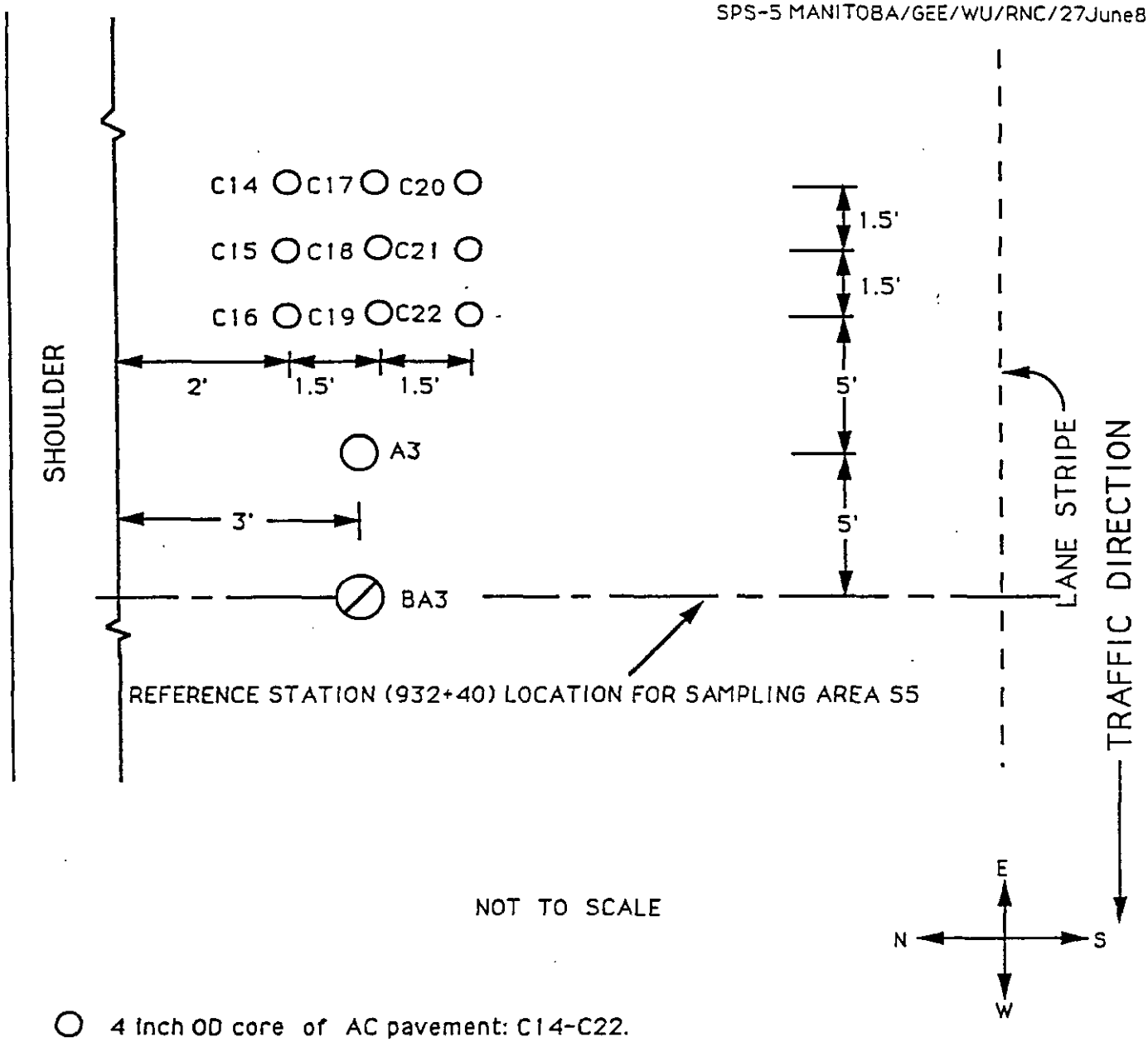
NO SAMPLES PLANNED BEFORE OVERLAY

Figure 4. Before overlay sampling plan for station 920+70 before section 5. Sampling area S3.



NO SAMPLES PLANNED BEFORE OVERLAY

Figure 5. Before overlay sampling plan for station 926+70 after section 5. Sampling area S4.



○ 4 inch OD core of AC pavement: C14-C22.

◯ 6 inch OD core through AC pavement surface; augering of granular base; thin-walled tube sampling and/or splitspoon sampling of subgrade to a depth 5 feet below top of subgrade, as directed by SHRP authorized representative: A3.

⊘ 12 inch OD core of AC pavement surface; augering of granular base and subgrade to a depth of 12 inches below top of subgrade for bulk sample retrieval: BA3.

Figure 6. Before overlay sampling plan for station 932+40 after section 7. Sampling area S5.

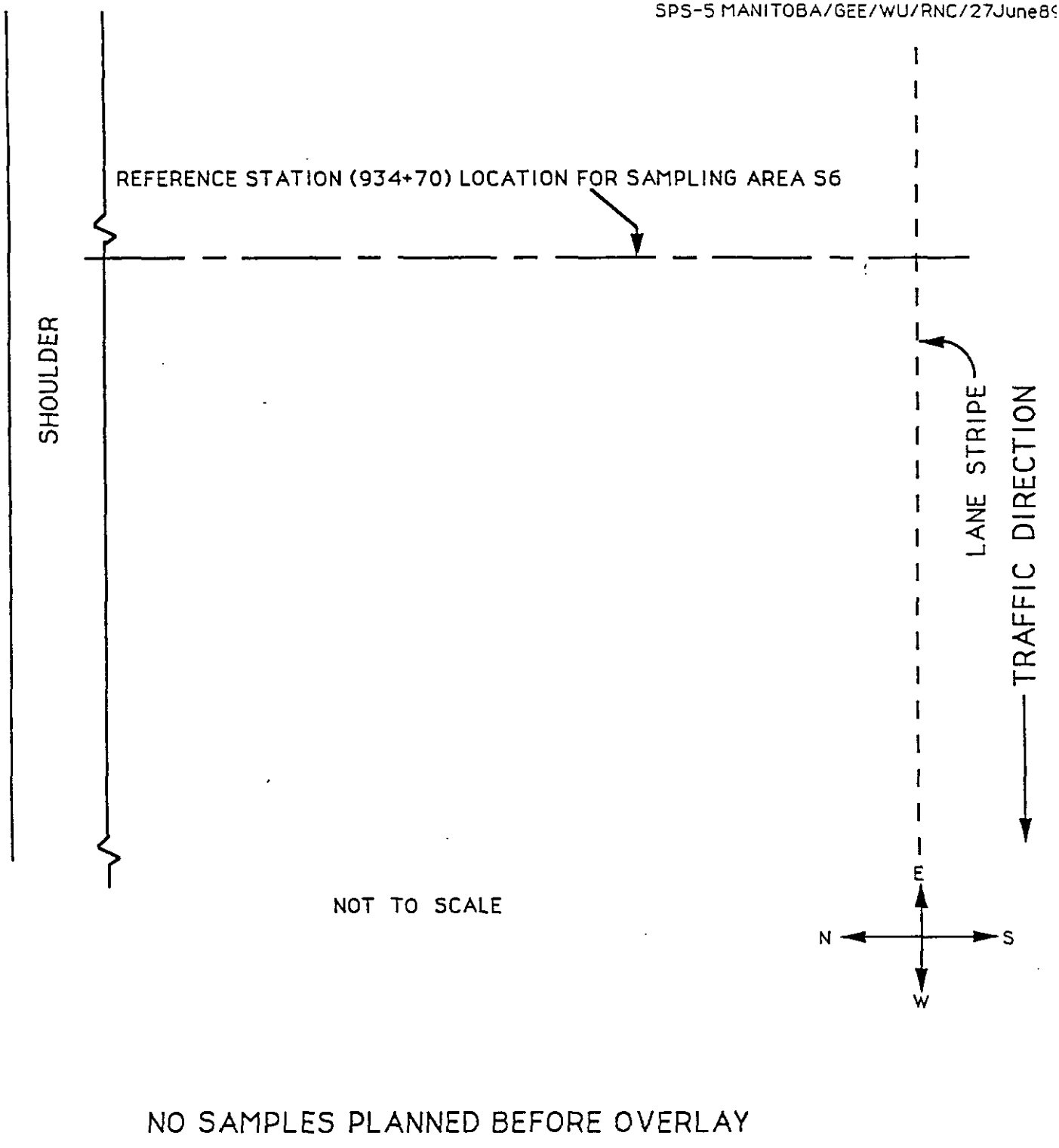
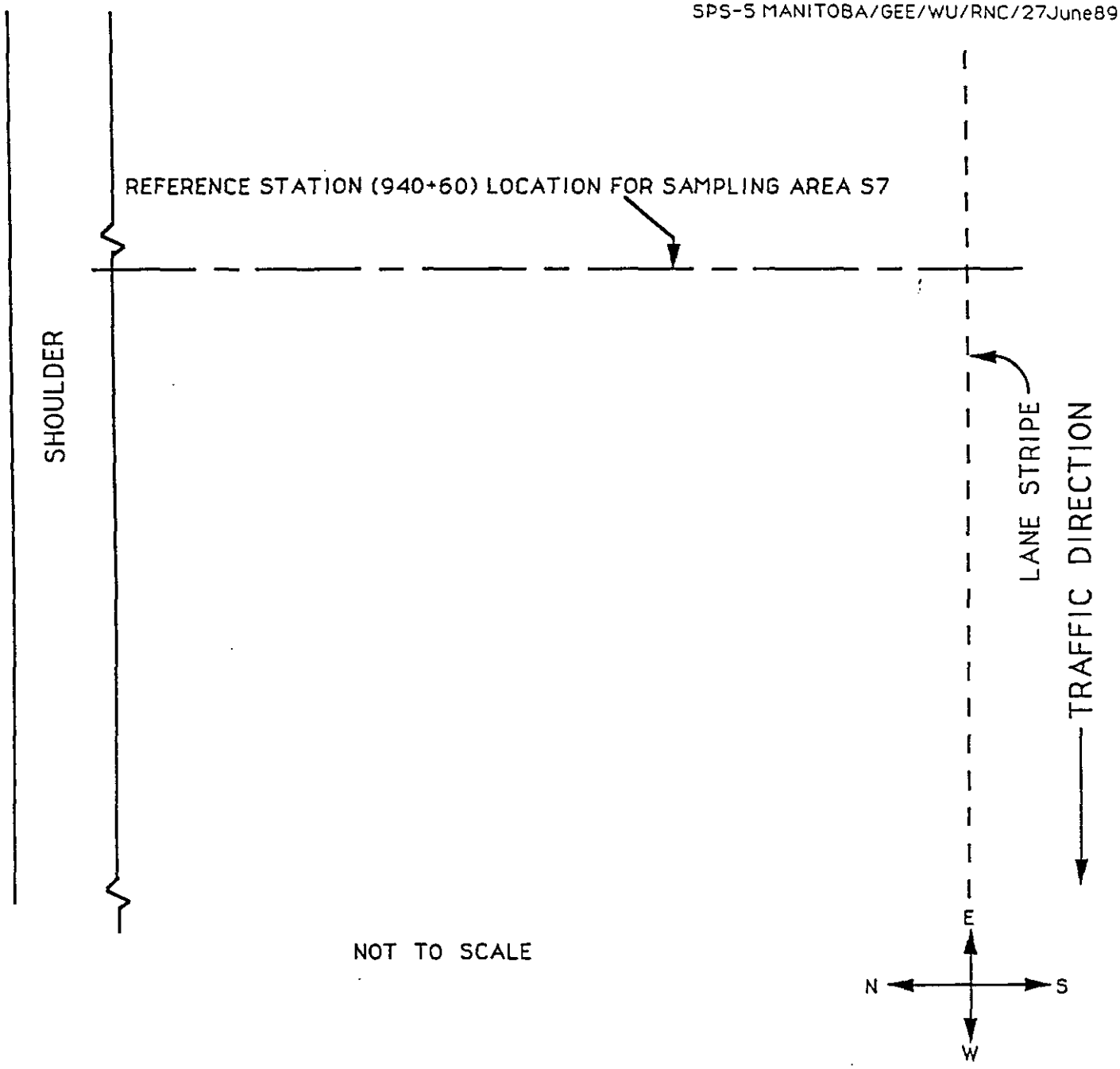
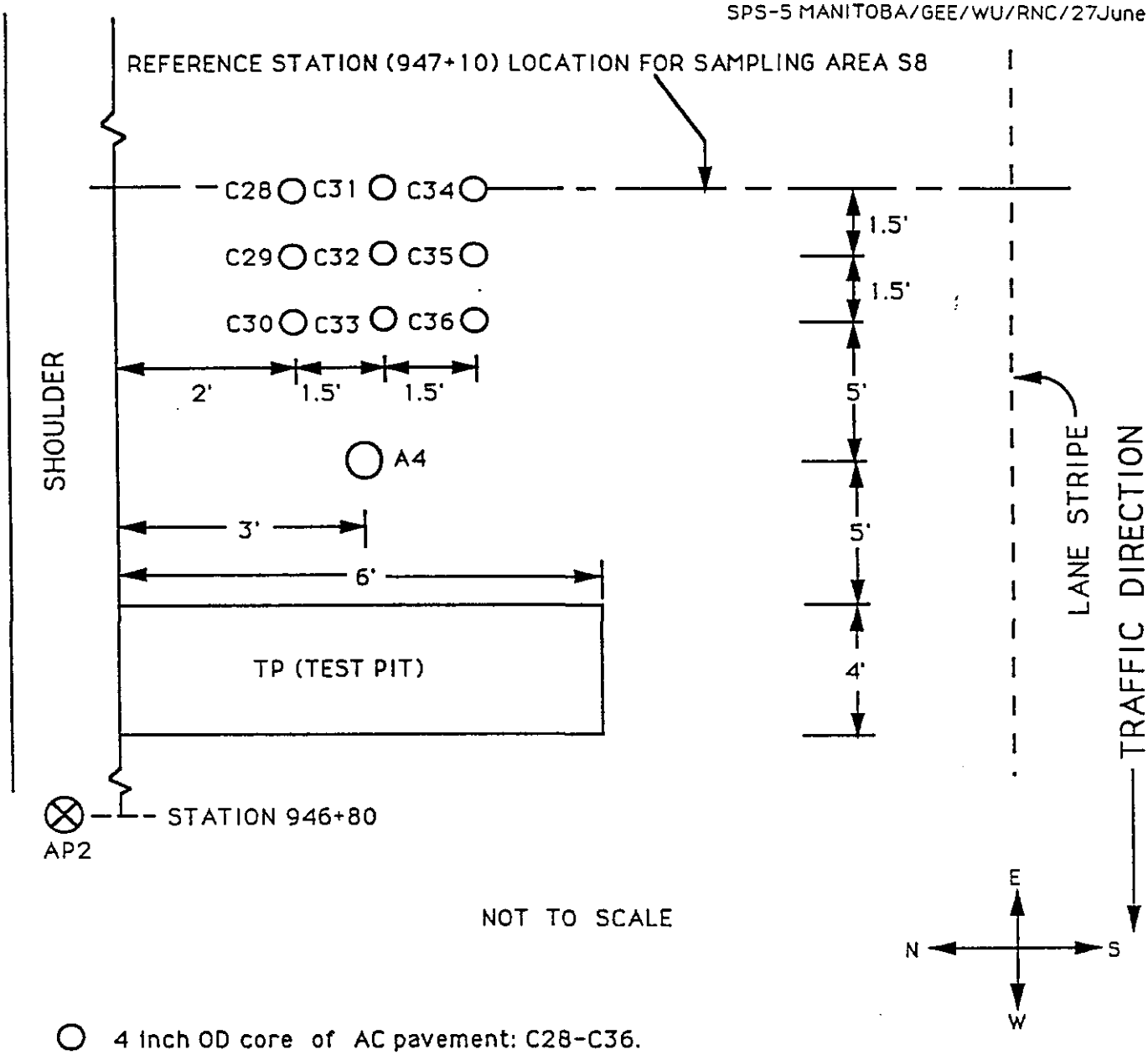


Figure 7. Before overlay sampling plan for station 934+70 before section 6. Sampling area S6.



NO SAMPLES PLANNED BEFORE OVERLAY

Figure 8. Before overlay sampling plan for station 940+60 before section 9. Sampling area S7.



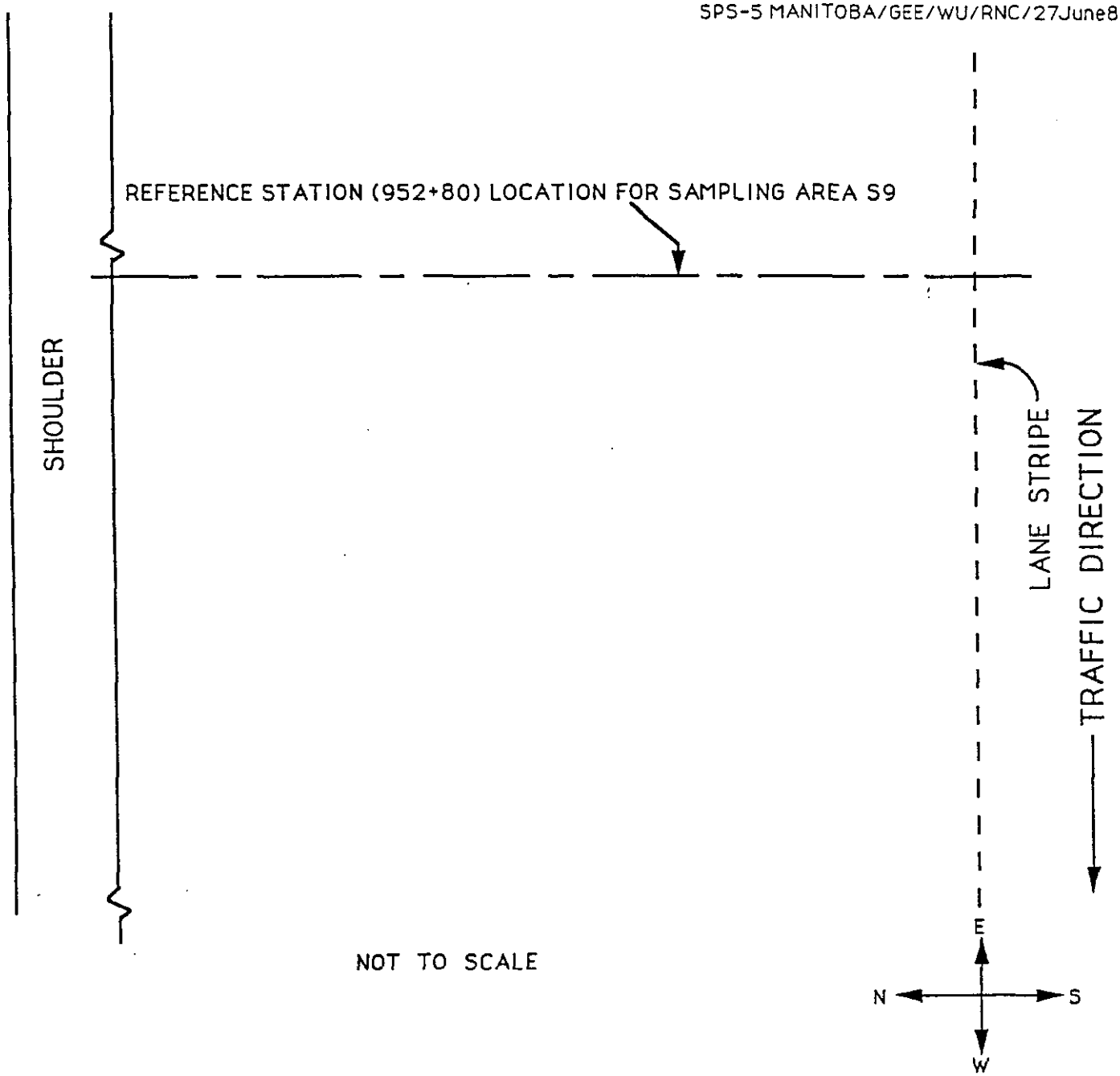
○ 4 inch OD core of AC pavement: C28-C36.

◯ 6 inch OD core through AC pavement surface; augering of granular base; thin-walled tube sampling and/or splitspoon sampling of subgrade to a depth 5 feet below top of subgrade, as directed by SHRP authorized representative: A4.

⊗ 4 inch or 6 inch OD auger probe through shoulder to a maximum depth of 20 feet or until refusal is encountered: AP2.

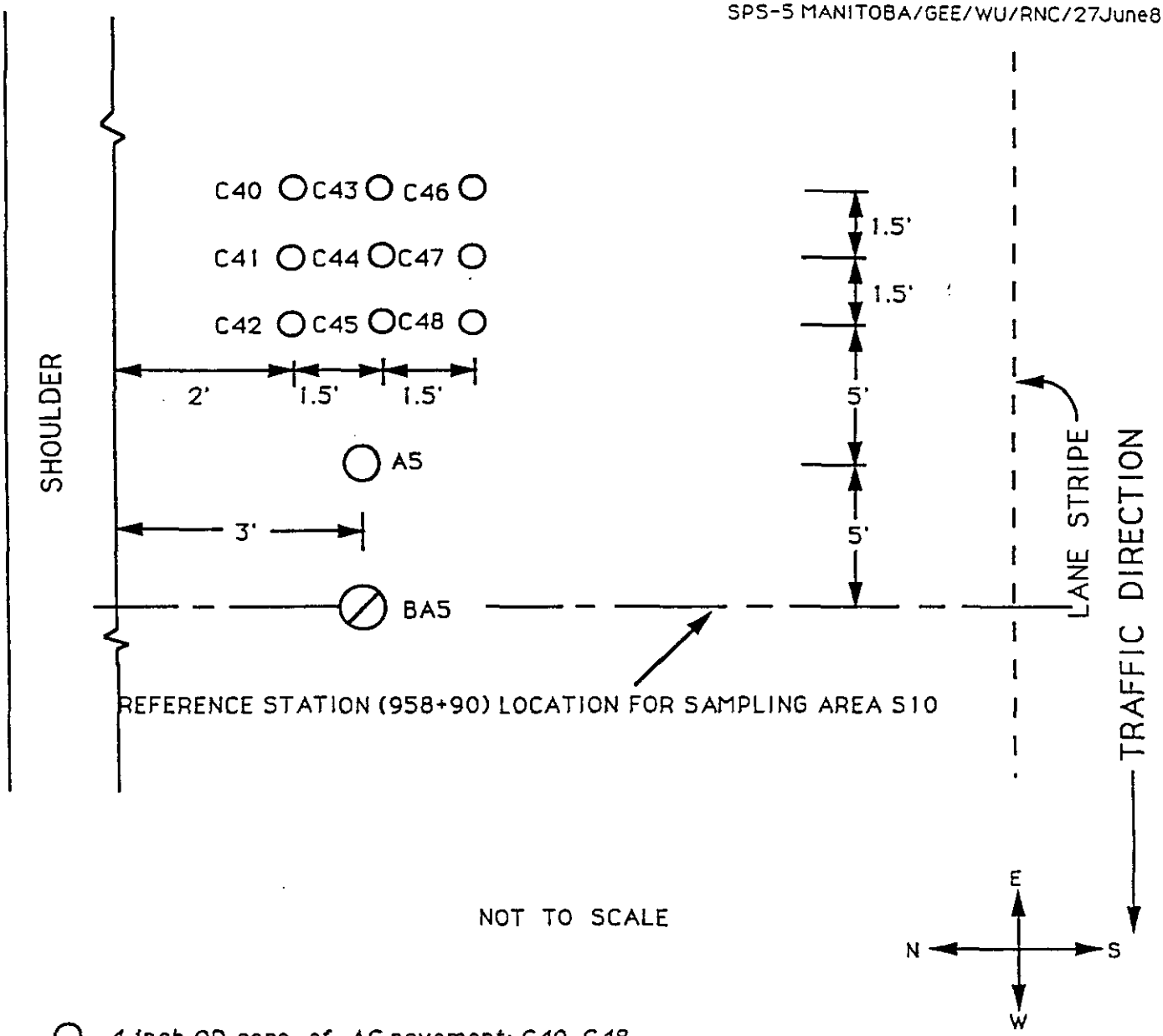
▭ Test pit (4' x 6' x 12" below top of subgrade). Removal of pavement layers; collection of pavement slabs; nuclear density and moisture measurements on granular base and subgrade; bulk sampling of granular base and subgrade: TP.

Figure 9. Before overlay sampling plan for station 947+10 before section 8. Sampling area S8.



NO SAMPLES PLANNED BEFORE OVERLAY

Figure 10. Before overlay sampling plan for station 952+80 after section 8. Sampling area S9.

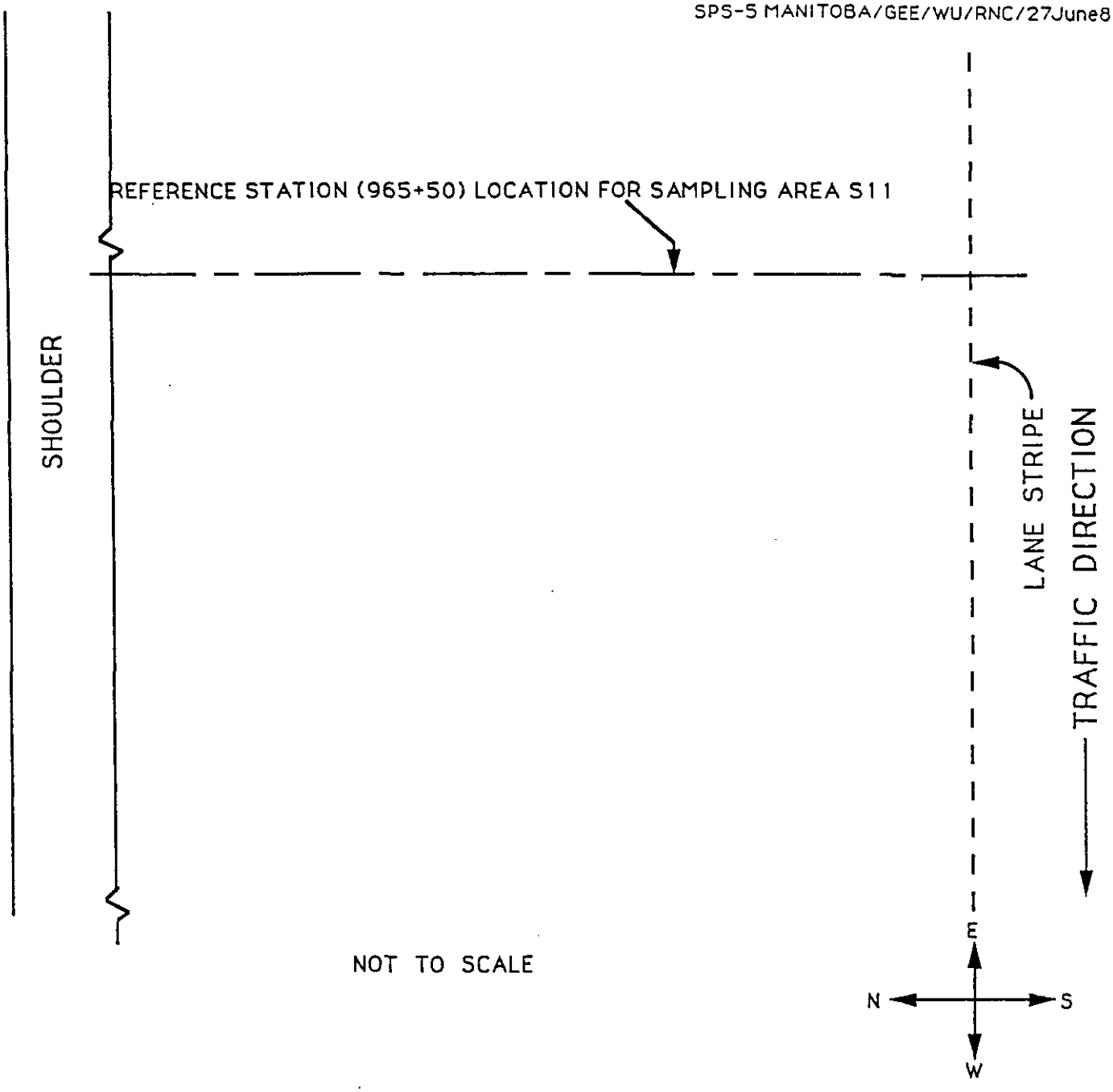


○ 4 inch OD core of AC pavement: C40-C48.

◯ 6 inch OD core through AC pavement surface; augering of granular base; thin-walled tube sampling and/or splitspoon sampling of subgrade to a depth 5 feet below top of subgrade, as directed by SHRP authorized representative: A5.

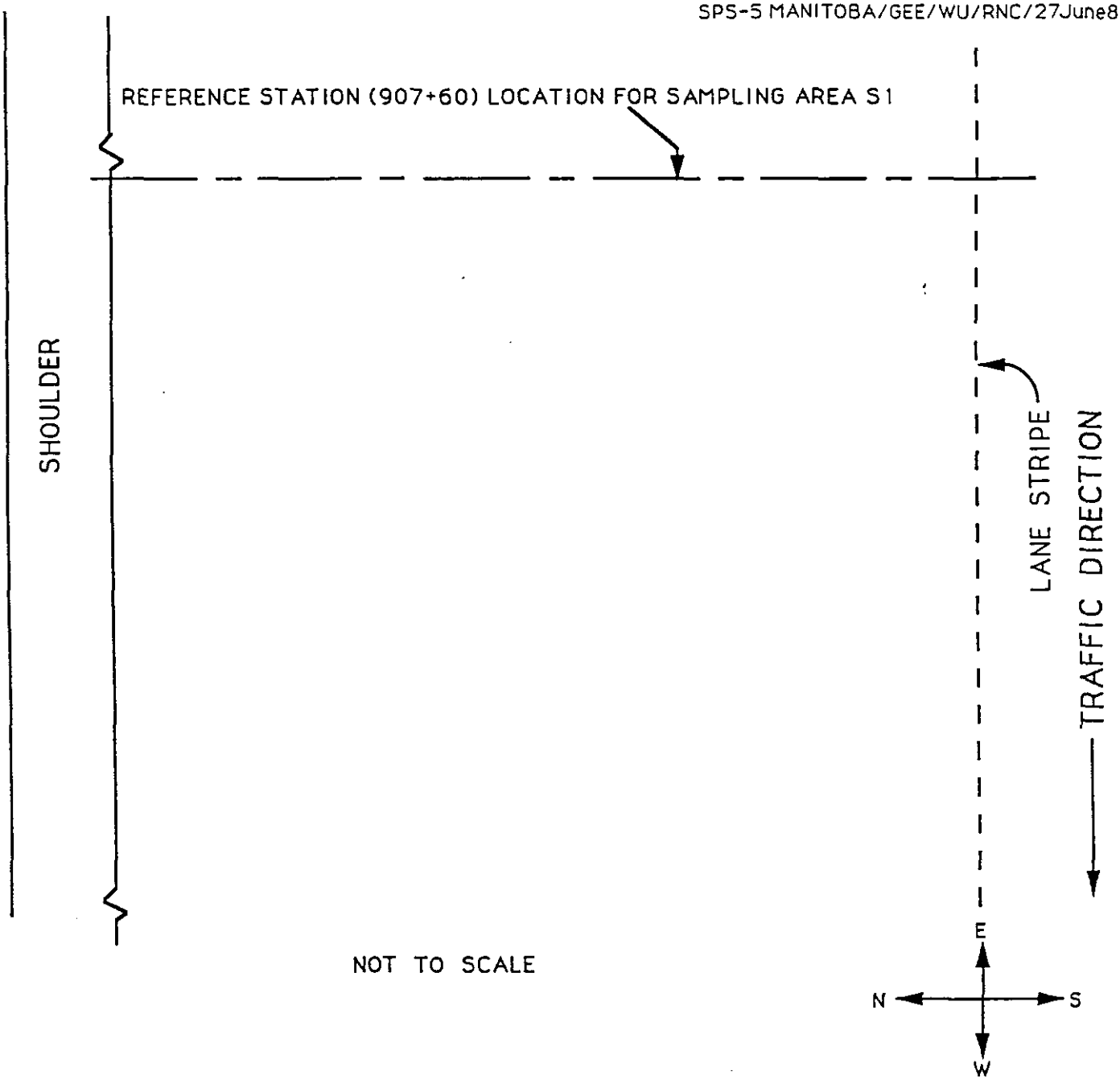
⊘ 12 inch OD core of AC pavement surface; augering of granular base and subgrade to a depth of 12 inches below top of subgrade for bulk sample retrieval: BA5.

Figure 11. Before overlay sampling plan for station 958+90 after section 3. Sampling area S10.



NO SAMPLES PLANNED BEFORE OVERLAY

Figure 12. Before overlay sampling plan for station 965+50 after section 2. Sampling area S11.



CONTROL SECTION; NO OVERLAY; NO SAMPLES PLANNED.

Figure 13. After overlay sampling plan for station 907+60 before section 1. Sampling area S1.

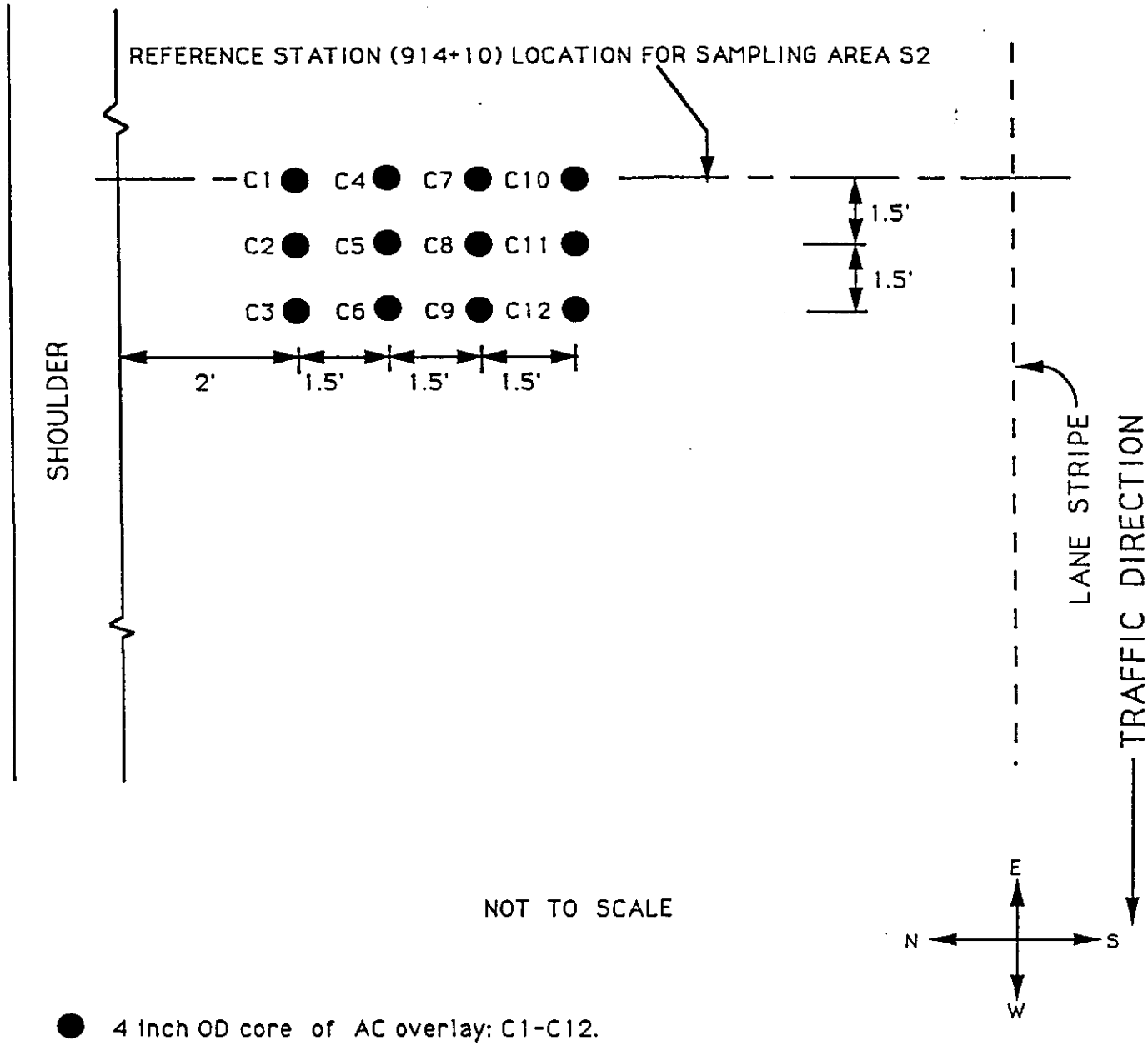


Figure 14. After overlay sampling plan for station 914+10 before section 4. Sampling area S2.

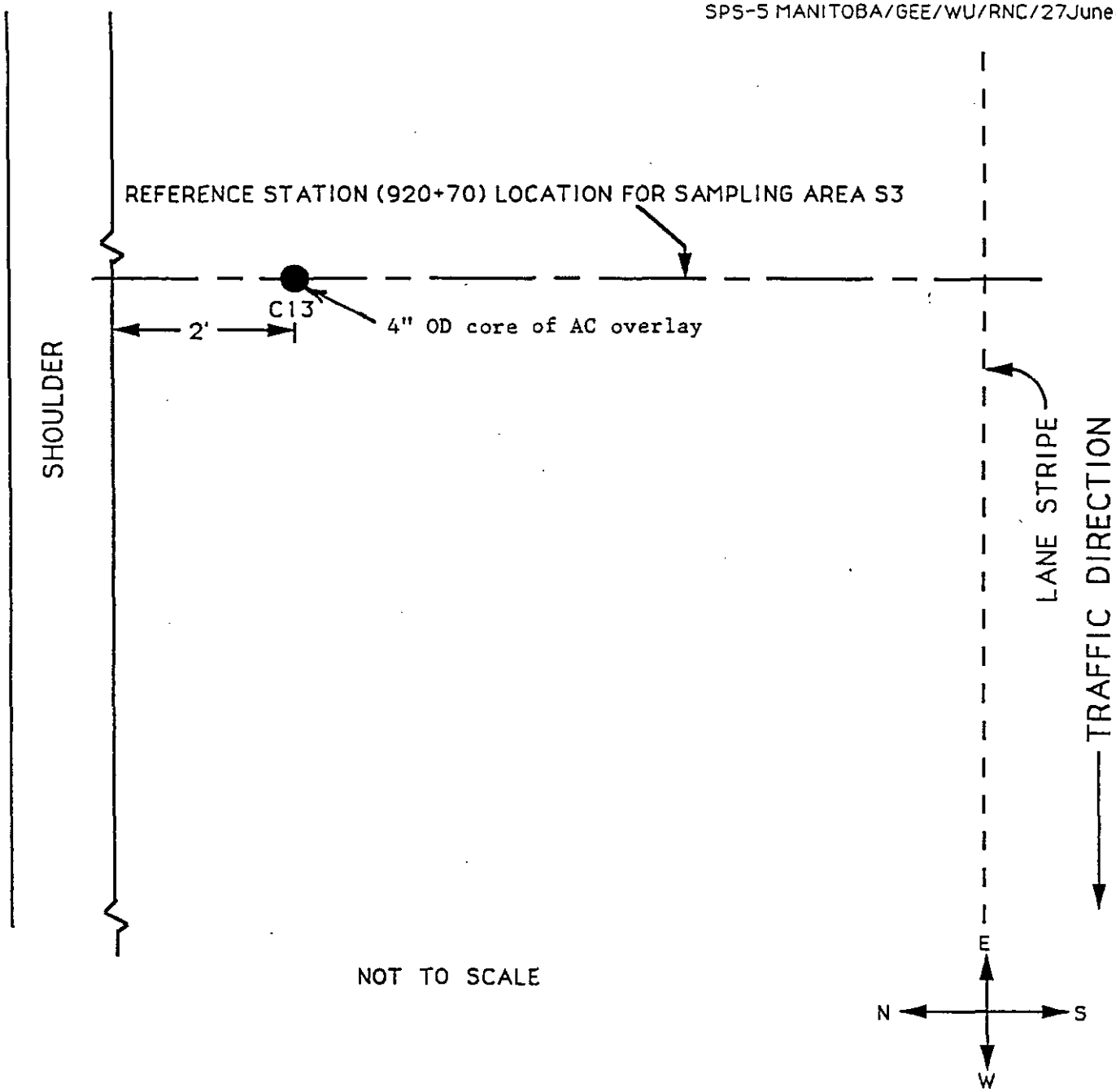
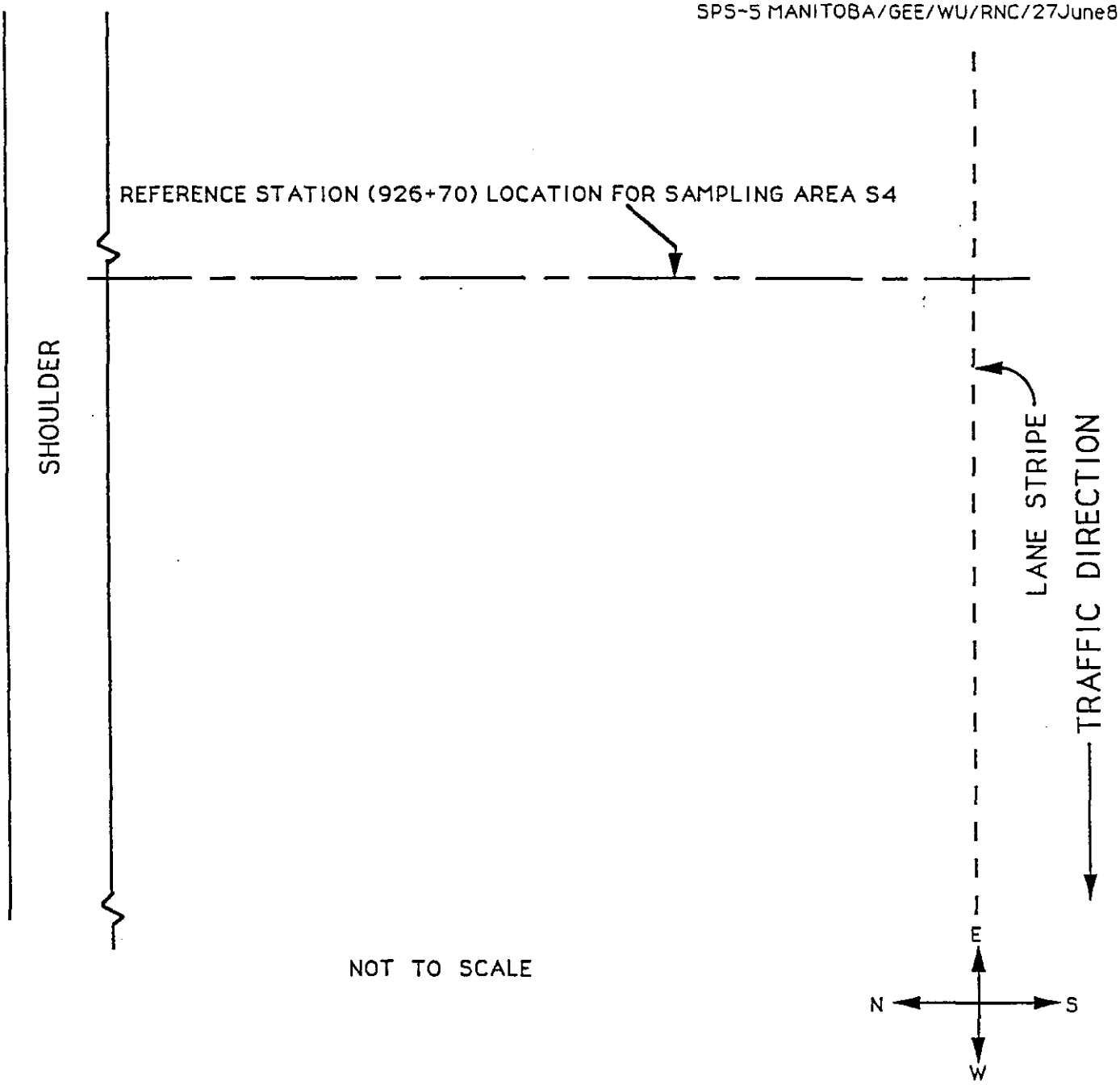


Figure 15. After overlay sampling plan for station 920+70 before section 5. Sampling area S3.



NO SAMPLES PLANNED AFTER OVERLAY

Figure 16. After overlay sampling plan for station 926+70 after section 5. Sampling area S4.

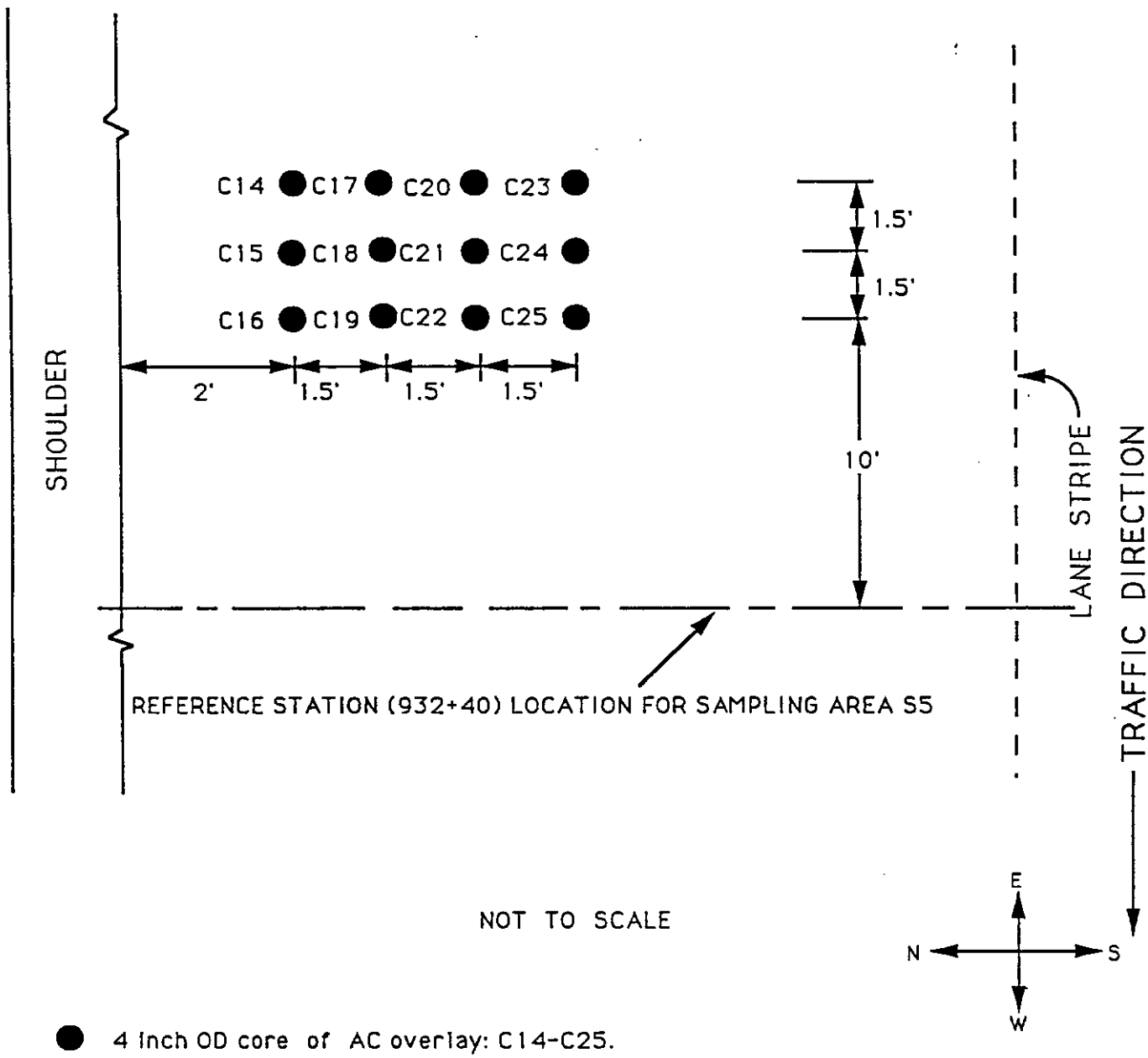


Figure 17. After overlay sampling plan for station 932+40 after section 7. Sampling area S5.

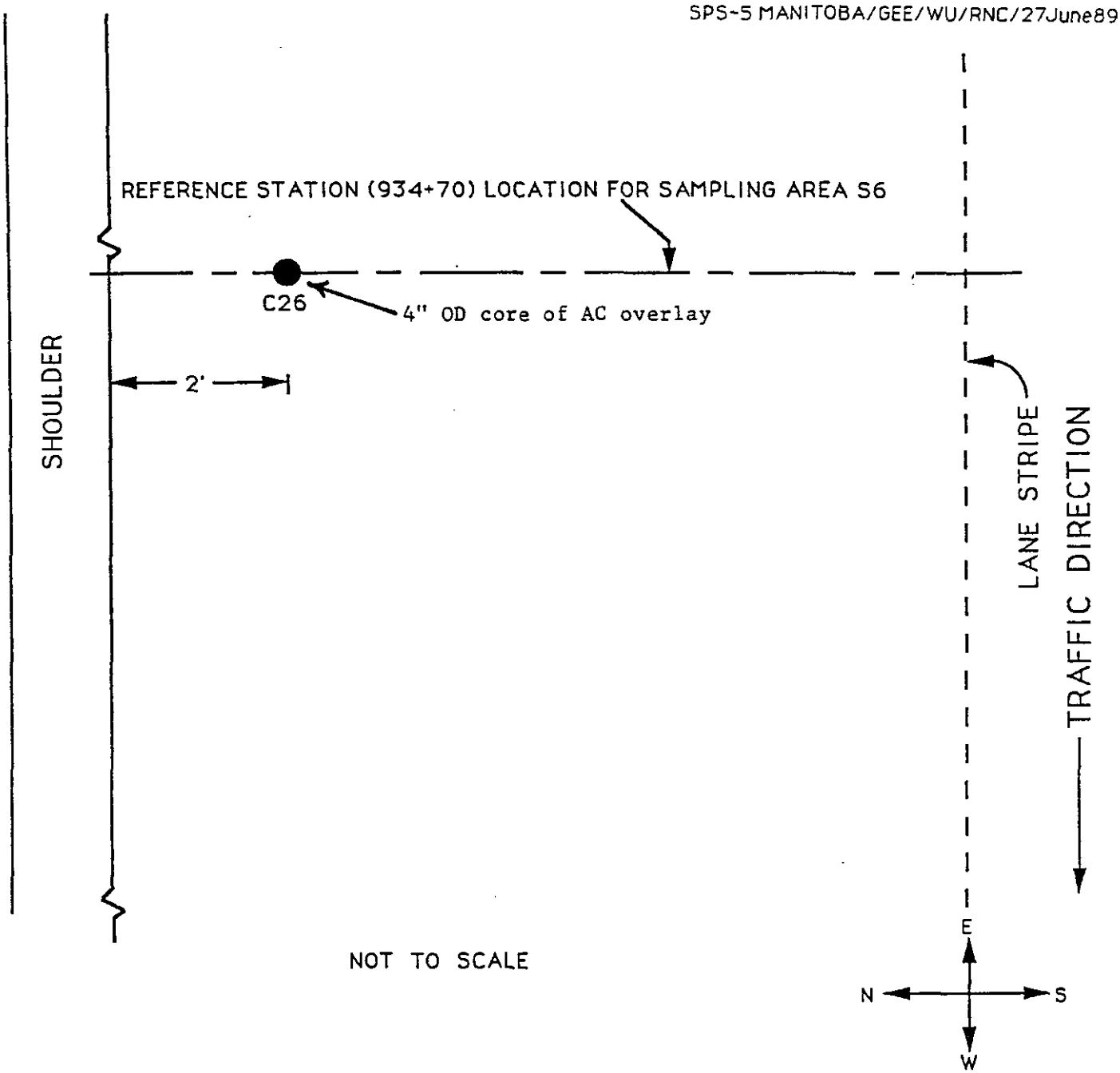


Figure 18. After overlay sampling plan for station 934+70 before section 6. Sampling area S6.

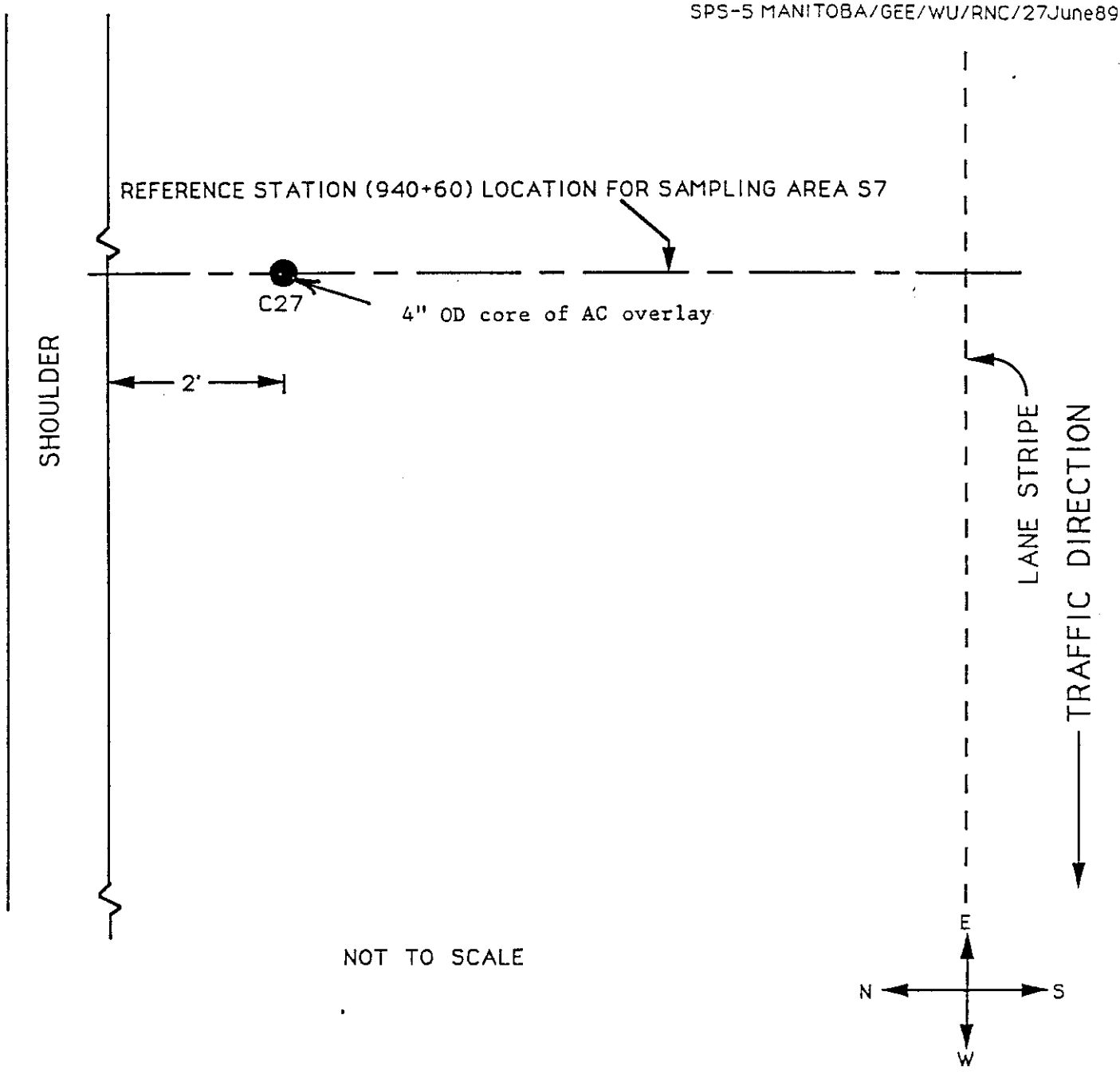


Figure 19. After overlay sampling plan for station 940+60 before section 9. Sampling area S7.

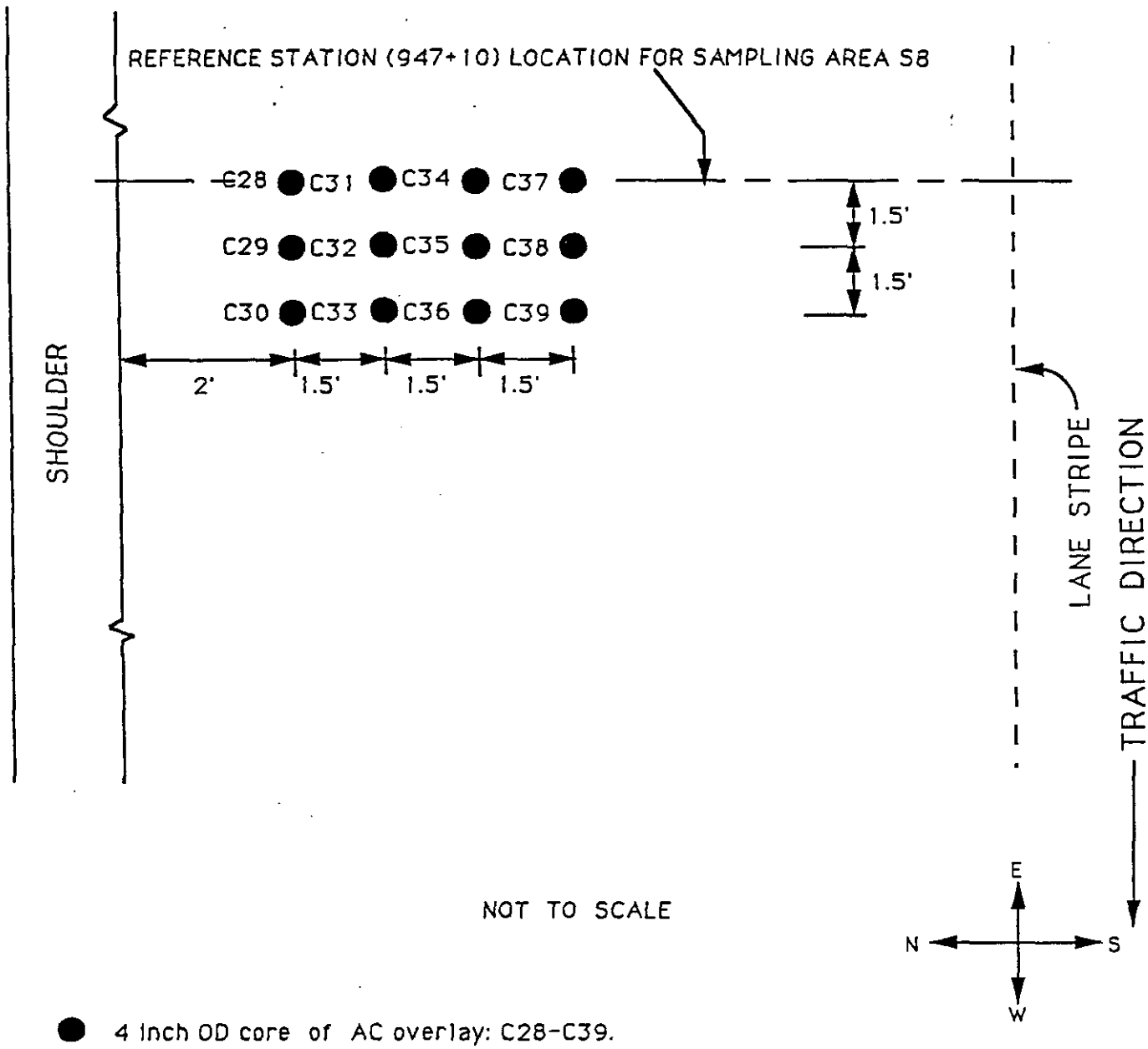
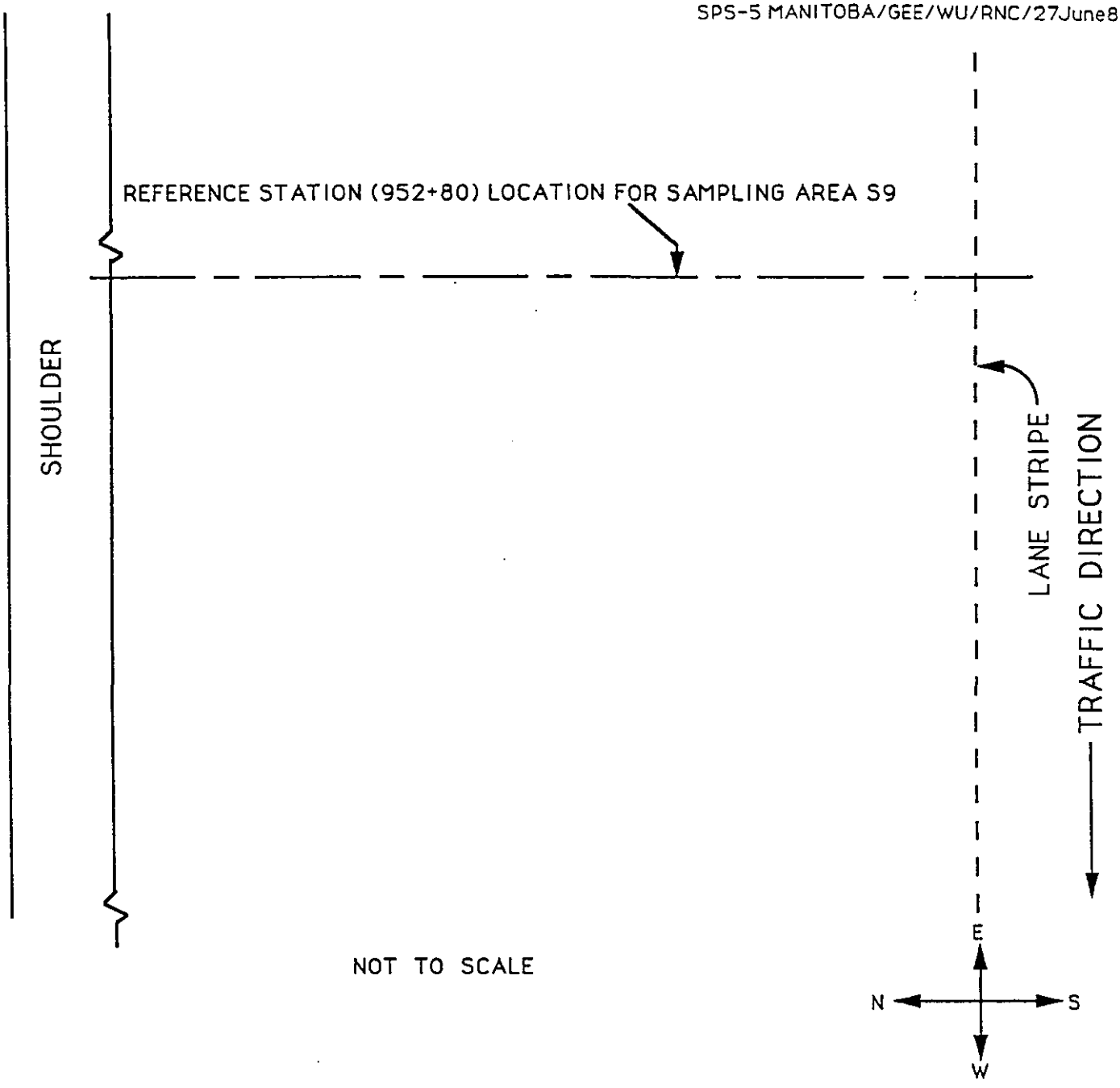


Figure 20. After overlay sampling plan for station 947+10 before section 8. Sampling area S8.



NO SAMPLES PLANNED AFTER OVERLAY

Figure 21. After overlay sampling plan for station 952+80 after section 8. Sampling area S9.

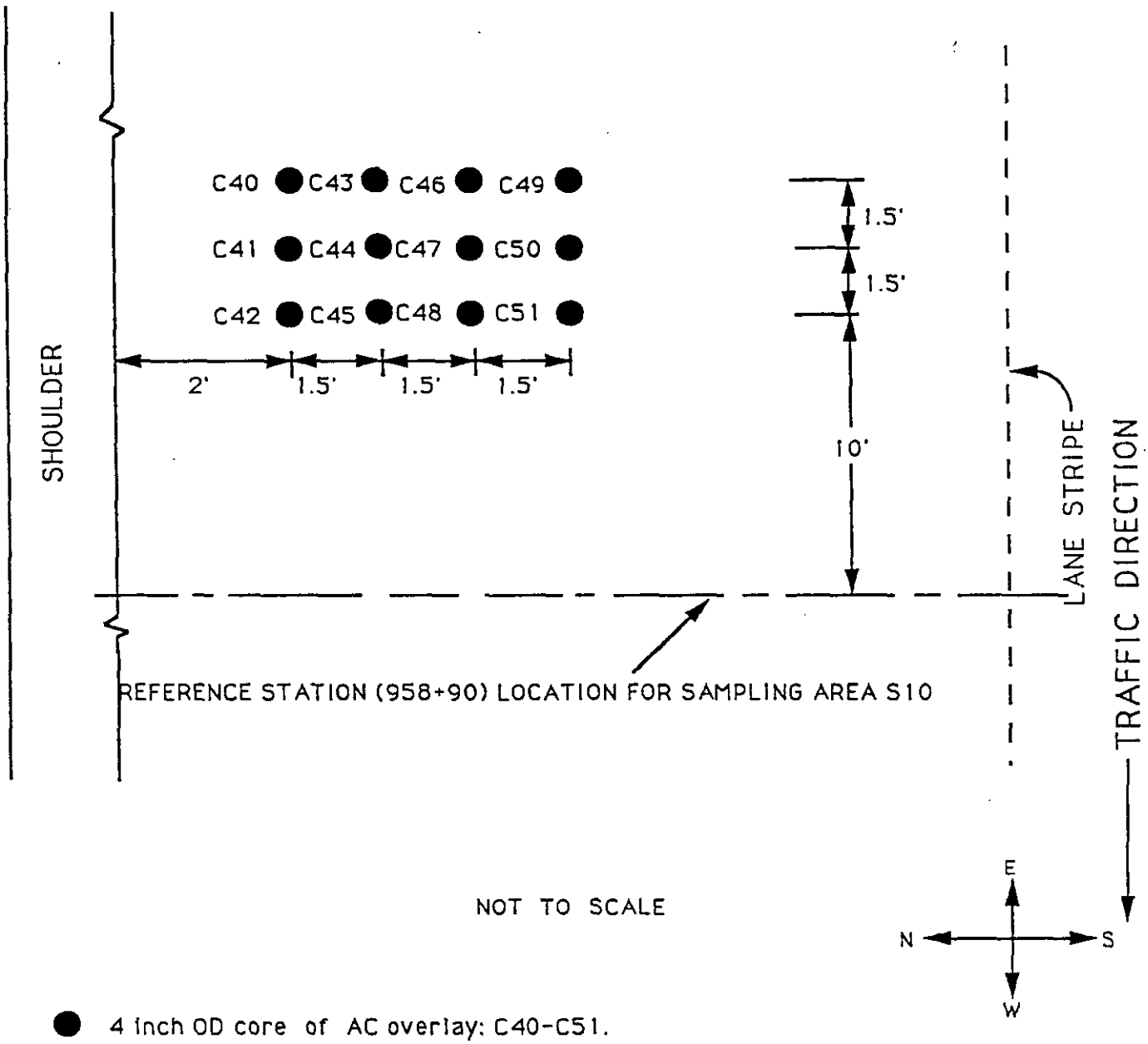


Figure 22. After overlay sampling plan for station 958+90 after section 3. Sampling area S10.

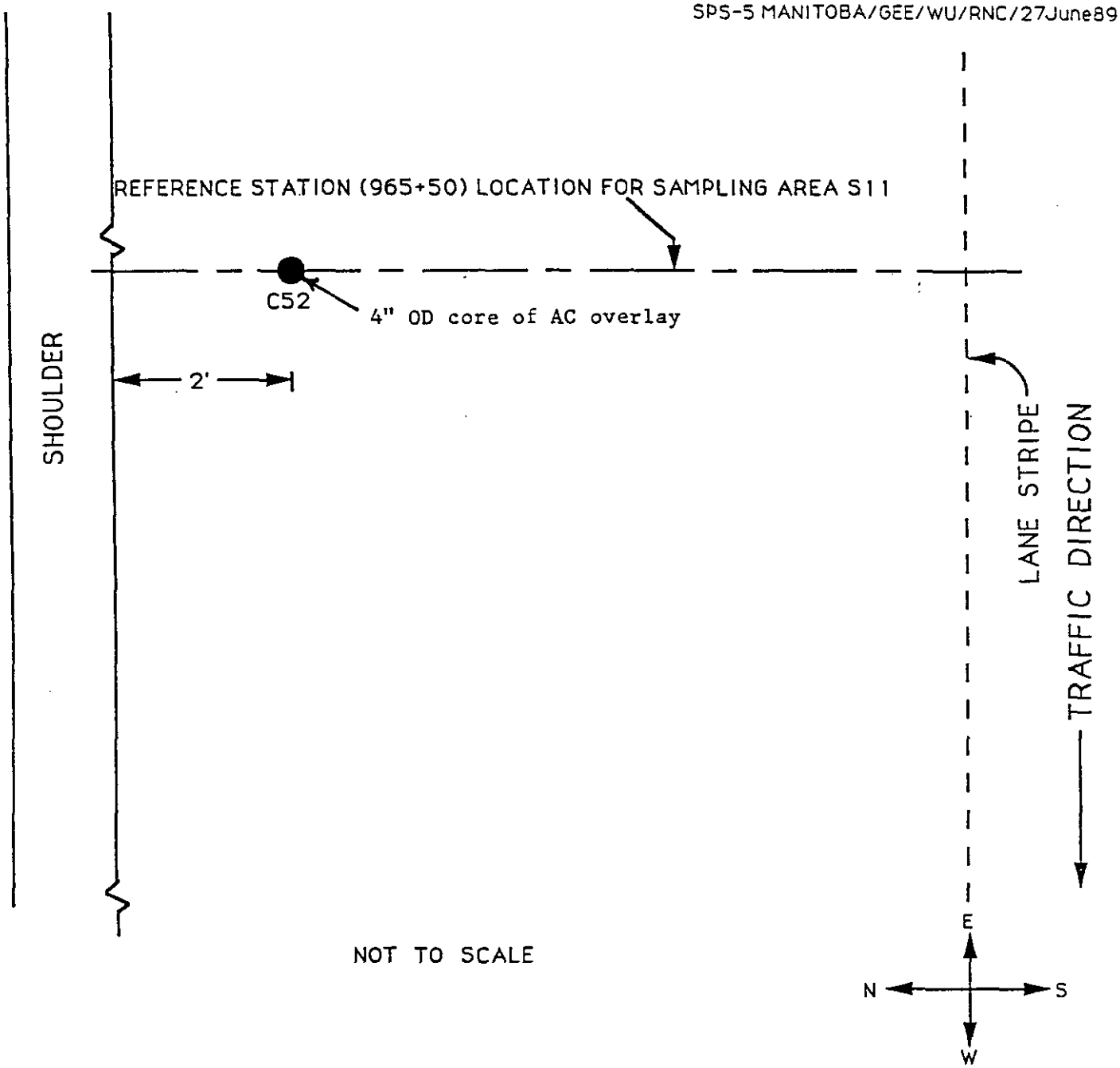


Figure 23. After overlay sampling plan for station 965+50 after section 2. Sampling area S11.

Attachment F

Construction Diary (Equipment Used)

DEPT. OF HIGHWAYS
MATERIALS AND RESEARCH

Construction Information (DAILY DIARY)
SPS-5 & GPS-6B (PTH 1 EAST)

General:

1) Asphalt Rollers & Pattern:

Breakdown - Steel vibratory, Bomag BW 220-R; 1 VIB + Static pass.
Intermediate - 9 Wheel rubber, American ~~Hose~~ Hoist Roll-O-Factor SP-3000; 2 passes.
Finish - Steel vibratory, Bomag BW 220-R; 1 or 2 passes.

2) Haul Trucks :

7 - 9 Semi trailer units, 20-25 ton capacity each

3) Tack coat :

SS-1 mixed 75% emulsion 25% water and applied @ 1/10 gal/Yd^2. Applied 30-40 minutes in advance of paving.

4) Asphalt finisher :

Blaw Knox PF 180H

5) Dead haul distance 14.7 Km

6) Average wait time; 5-10 minutes

7) Milling machine was a Cedarapids 1900 C

Note:

Mix temperatures were taken ~~form~~ FROM the mat immediately behind the pawer.

SPS-5 :

Sept. 7/89 Cloudy, +5°C, Dry

830508 Section 8,9,6,7 Travel Lane, Mill Lift
830509 Temperature 130-132°C
830506 Start paving @ 2:00 P.M.
830507 Stop paving @ 3:20 P.M.
Open to traffic @ 6:00 P.M.

830508
830509 Section 8,9, Passing Lane, Mill Lift
Laydown temperature 130-132°C
Start paving @ 6:00 P.M.
Stop paving @ 7:25 P.M.
Open to traffic @ 8:00 P.M.

Sept. 8/89 Partly Cloudy, Windy, Dry +10°C

830506
830507 Section 6,7 Passing Lane, Mill Lift
Laydown temperature 128-130°C
Start paving @ 6:30 A.M.
Stop rolling @ 10:00 A.M.
Open to traffic @ 10:15 A.M.

830507
830504 Section 7,4 Travel Lane, Bottom Lift
Laydown temperature 130°C
Start paving @ 11:00 A.M.
Stop paving @ 12:00 A.M.
Open to traffic 1:00 P.M.

830503
830508 Section 3,8 Travel Lane, Bottom Lift
Laydown temperature 128-132°C
Start paving @ 12:15 P.M.
Stop rolling @ 1:30 P.M.
Open to traffic @ 2:30 P.M.

830503
830508 Section 3,8 Passing Lane, Bottom Lift
Laydown temperature 128-132°C
Start paving @ 2:30 P.M.
Stop paving @ 3:05 P.M.
Open to traffic @ 4:30 P.M.

Sept. 9&10/89 No Work (Weekend)

Sept. 11/89 No Work, rained out

Sept. 12/89 Sunny, Light Wind, +4°C, Dry

830503
830508 Section 3,8 Travel Lane, Lift 2
laydown temperature 132-135°C
Start paving @ 9:40 A.M.
Stop paving @ 10:15 A.M
Stop rolling @ 10:45 A.M.
Open to traffic @ 12 Noon

830507 Section 7,4 Travel Lane, Lift 2
830504 Laydown temperature 130-132°C
Start paving @ 10:15 A.M.
Stop paving @ 11:05 A.M.
Stop rolling @ 11:40 A.M.
Open to traffic @ 12:00 Noon
Note - Sta. 919+50 large patch in existing pavement

830502 Section 2,3,8,9 Travel Lane, Top Lift
830503 Laydown temperature 129-132°C
830508 Start paving @ 3:15 P.M.
830509 Stop paving @ 5:00 P.M.
Stop rolling @ 6:00 P.M.
Open to traffic @ 7:30 P.M.

830506 Section 6,7,4,5 Travel Lane, Top Lift
830507 Laydown temperature 129-130°C
830504 Start paving @ 5:00 P.M.
830505 Stop paving @ 6:40 P.M.
Stop rolling @ 7:20 P.M.
Open to traffic @ 7:30 P.M.

Sept. 13/89 Clear to partly cloudy, light wind, cool A.M, mild P.M.

830502 Section 2,3,8,9 Passing Lane, Top Lift
830503 Laydown temperature 135-140°C
830508 Start paving @ 11:20 A.M.
830509 Stop paving @ 12:40 P.M.
Stop rolling @ 2:00 P.M.
Open to traffic @ 4:30 P.M.

830506 Section 6,7,4,5 Passing Lane, Top Lift
830507 Laydown temperature 135-140°C
830504 Start paving @ 1:10 P.M.
830505 Stop paving @ 2:20 P.M.
Stop rolling @ 3:05 P.M.
Open to traffic @ 4:30 P.M.

GPS - 6B:

Sept.8/89 Partly Cloudy, Windy, Dry, +10°C

GPS
836450
Section 1 Travel Lane, Bottom Lift
Laydown temperature 127-132°C
Start paving @ 1:30 P.M.
Stop rolling @ 2:00 P.M.
Open to traffic @ 3:25 P.M.

Note: The plant was switched to RAP mix too soon resulting in a shortage of two loads. This area was completed when the passing lane was done.

GPS
836450
Section 1 Passing Lane, Bottom Lift
Laydown temperature 127-134°C
Start paving @ 3:55 P.M.
Stop paving @ 4:20 P.M.
Open to traffic @ 5:20 P.M.

Sept.12/89 Sunny, Light Wind, +4°C, Dry

GPS
836450
Section 1 Travel Lane, Lift 2
Laydown temperature 129-131°C
Start paving @ 11:15 A.M.
Stop paving @ 11:45 A.M.
Stop rolling @ 12:30 P.M.
Open to traffic @ 12:45 P.M.

GPS
836450
Section 1 Passing Lane, Lift 2
Laydown temperature 129-130°C
Start paving @ 2:05 P.M.
Stop paving @ 2:45 P.M.
Stop rolling @ 3:00 P.M.
Open to traffic @ 3:30 P.M.

Sept.13/89 Clear to Partly Cloudy, Light Wind, Cool A.M. Mild P.M.

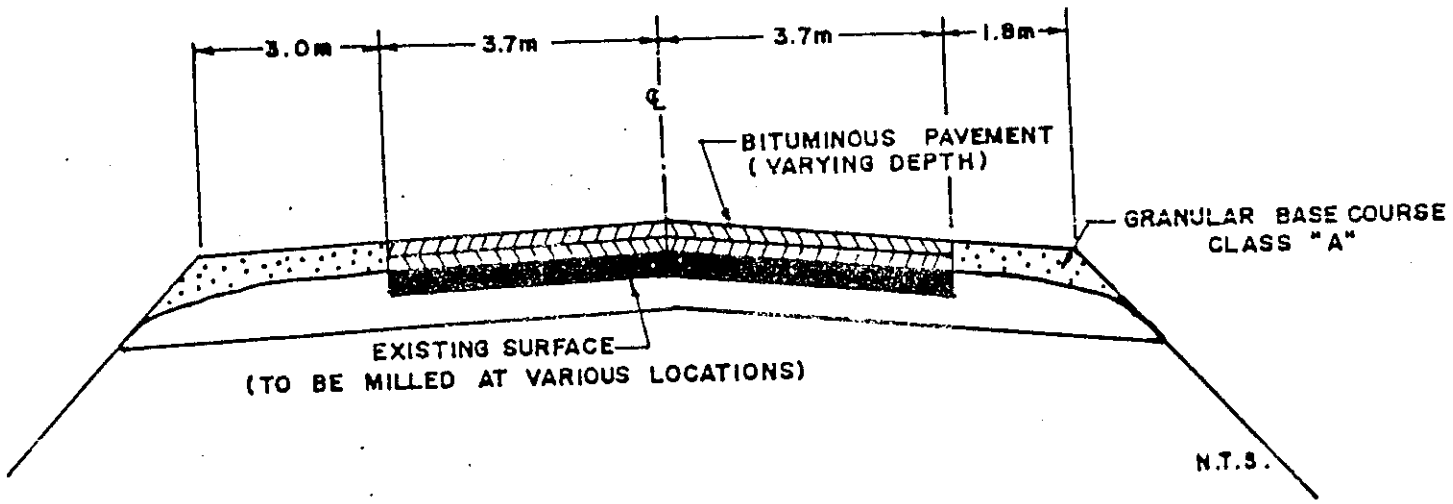
GPS
836450
836451
Section 1,2 Travel Lane, Top Lift
Laydonw temperature 135-140°C
Start paving @ 8:20 A.M.
Stop paving @ 9:45 A.M.
Stop rolling @ 10:45 A.M.
Open to traffic @ 11:45 A.M.

Sept.13/89 Clear to Partly Cloudy, Light Wind, Mild

GPS
836450
836451
Section 1,2 Passing Lane, Top Lift
Laydown temperature 120-130°C
Start paving @ 2:20 P.M.
Stop paving @ 3:30 P.M.
Stop rolling @ 4:50 P.M.
Open to traffic @ 5:15 P.M.

Attachment G

Standard Cross Section



STANDARD CROSS SECTION
OF
BITUMINOUS SURFACING
WESTBOUND LANES
P.T.H. No. 1E
(BROKENHEAD RIVER – WEST)

PROVINCE OF MANITOBA
B. W. PRENTICE
89 06 21
REGISTERED ENGINEER

DIRECTOR OF MATERIALS & RESEARCH

DIRECTOR OF CONSTRUCTION

DISTRICT ENGINEER

Manitoba Highways and Transportation
STEINBACH
JUNE
DISTRICT 02
1989

EXECUTIVE DIRECTOR,
PLANNING DESIGN & LAND SURVEYS

DATE July 4/89

Nº 19224 C SHEET 1 OF 1

Attachment H

Summary of 1995 Sampling of Asphalt Concrete

ADD 100 TO EACH LOCATION #

Test Cell	Set	Location	Hole Date	Station (ft.)	Position (ft.)	Total Thickness (inches)	
83 0502	4	C55/155	01/23/95	-124.7	3.5	6.8	
	4	C56/156	01/23/95	-124.7	6	6.7	
	4	C57/157	01/23/95	-124.7	8.5	7.2	
	4	C1/101	01/23/95	-26.2	3.5	5.4	
	4	C2/102	01/23/95	-26.2	6	4.3	P
	4	C3/103	01/23/95	-26.2	8.5	6.9	PAETICAL CORE
	4	C4/104	01/23/95	532.8	3.5	3.5	P
	4	C5/105	01/23/95	532.8	6	7.5	
	4	C6/106	01/23/95	532.8	8.5	7.4	
83 0503	4	C7/107	01/23/95	-23.0	3.5	9.3	
	4	C8/108	01/23/95	-23.0	6	7.0	P
	4	C9/109	01/23/95	-23.0	8.5	9.4	
83 0506	4	C10/110	01/23/95	-26.2	3.5	6.8	P
	4	C11/111	01/23/95	-26.2	6	8.7	
	4	C12/112	01/23/95	-26.2	8.5	9.6	
	4	C13/113	01/23/95	-6.5	3.5	7.5	
	4	C14/114	01/23/95	-6.5	6	8.5	
	4	C15/115	01/23/95	-6.5	8.5	8.7	
	4	C16/116	01/23/95	513.0	3.5	Broken	ASK - THEY KEPT
	4	C17/117	01/23/95	513.0	6	6.4	P
	4	C18/118	01/23/95	513.0	8.5	9.6	
83 0509	4	C19/119	01/23/95	-13.0	3.5	7.6	
	4	C20/120	01/23/95	-13.0	6	7.3	
	4	C21/121	01/23/95	-13.0	8.5	7.4	
	4	C22/122	01/24/95	513.0	3.5	6.0	P?
	4	C23/123	01/24/95	513.0	6	7.7	
	4	C24/124	01/24/95	513.0	8.5	7.8	
83 0506	4	C25/125	01/24/95	-29.5	3.5	7.4	
	4	C26/126	01/24/95	-29.5	6	6.6	
	4	C27/127	01/24/95	-29.5	8.5	6.6	
	4	C28/128	01/24/95	526.2	3.5	8.3	
	4	C29/129	01/24/95	526.2	6	7.6	
	4	C30/130	01/24/95	526.2	8.5	7.4	
83 0507	4	C58/158	01/24/95	-65.0	3.5	8.5	
	4	C59/159	01/24/95	-65.0	6	8.3	
	4	C60/160	01/24/95	-65.0	8.5	8.7	
	4	C31/131	01/24/95	-3.3	3.5	9.8	
	4	C32/132	01/24/95	-3.3	6	9.2	
	4	C33/133	01/24/95	-3.3	8.5	9.3	
	4	C34/134	01/24/95	503.3	3.5	9.6	

ADD 100 TO EACH LOCATION

Test Cell	Set	Location	Hole Date	Station (ft.)	Position (ft.)	Total Thickness (inches)	
83 0507	4	C35/135	01/24/95	503.3	6	9.6	
	4	C36/136	01/24/95	503.3	8.5	9.6	
83 0504	4	C37/137	01/24/95	-13.0	3.5	9.3	
	4	C38/138	01/24/95	-13.0	6	6.5	-P
	4	C39/139	01/24/95	-13.0	8.5	10.0	
	4	C40/140	01/24/95	510.0	3.5	8.6	
	4	C41/141	01/24/95	510.0	6	7.2	-P
	4	C42/142	01/24/95	510.0	8.5	10.0	
83 0505	4	C43/143	01/24/95	-16.5	3.5	8.6	
	4	C44/144	01/24/95	-16.5	6	7.6	
	4	C45/145	01/24/95	-16.5	8.5	8.1	
	4	C46/146	01/24/95	503.3	3.5	7.6	
	4	C47/147	01/24/95	503.3	6	7.4	
	4	C48/148	01/24/95	503.3	8.5	7.1	
83 0501	4	C49/149	01/24/95	-23.0	3.5	6.3	
	4	C50/150	01/24/95	-23.0	6	6.1	
	4	C51/151	01/24/95	-23.0	8.5	5.8	
	4	C52/152	01/24/95	503.3	3.5	4.8	
	4	C53/153	01/24/95	503.3	6	5.0	
	4	C54/154	01/24/95	503.3	8.5	5.0	

Important Notes:

"Station" represents the relative distance from each particular test cell.

"Position" represents the relative distance from the edge of pavement.
3.5 ft. (or 1.1 m) - Right Wheel Path
6 ft. (or 1.8 m) - Center of Lane
8.5 ft. (or 2.6 m) - Left Wheel Path

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To Ben Worel	From Dennis
Co.	Co.
Dept.	Phone #
Fax (612) 942-3059	Fax #

Attachment I

Pre Construction Activities Paper

11

THE MANITOBA SPS-5 PROJECT

PRE-CONSTRUCTION ACTIVITIES

Presentation to the
NORTH CENTRAL REGIONAL MEETING
St. Paul, Minnesota
August 24, 1989

Ray A. Van Cauwenberghe
SHRP-LTPP Engineer
Materials & Research Branch
Manitoba Department of Highways & Transportation

THE MANITOBA SPS-5 PROJECT

R. A. Van Cauwenberghe

August 1989

The SPS-5 (Specific Pavement Studies) project is a SHRP (Strategic Highway Research Program) experiment to evaluate rehabilitation techniques for asphalt concrete pavements. The techniques employed in this experiment are the placement of a thin and a thick overlay, using virgin and recycled asphaltic concrete mixes, on existing asphalt concrete surfaces which were not repaired prior to the overlay and on existing surfaces which were milled to correct cross-section and profile deficiencies prior to the overlay.

PROJECT LOCATION AND DESCRIPTION

The Manitoba project is one of the four SPS-5 projects which will be constructed in the dry, freeze environmental zone. The existing surface is considered to be in poor condition; this has not been verified by SHRP.

This section is located on Provincial Trunk Highway (PTH) 1, which is also part of the Trans-Canada Highway. Geographically, the site is 53 miles West of the Province of Ontario, 45 miles north of the Minnesota State Border, and 35 miles south-east of PTH 100 (the Winnipeg City Perimeter Highway), as shown on Figure 1.

The test sections are located on the west bound traffic lane of a four-lane divided highway. The low fill embankment, which was constructed in 1970, consists of a rural cross-section with 5 to 6 foot ditches. The median is depressed and is 110 feet wide.

The subgrade material is an imported A-4, sandy silt, which is highly frost susceptible. The average Atterberg limits are Liquid Limit 19%, Plastic Limit 14%, and Plasticity Index 5%. Approximately 90% of the material passes the #40 sieve, and 42% passes the #200 sieve.

The pavement surface was constructed in 1971 and consists of the following:

Pavement Layer	Type	Design Thickness inches
Asphalt Concrete	SC 3000	4
Base Course	3/4" clay bound crushed granular	5
Sub base	1 1/2" clay bound screened granular	8

The surface consists of two 12 foot wide paved lanes with gravel shoulders; 6 feet wide on the inside, and 10 feet wide on the outside. The cross-slope is 2%, one-way.

The 1987 traffic data is:

ADT in the west bound direction	1964
Trucks	14%
Estimated Annual Traffic Growth Rate	1%
Estimated ESAL/yr (traffic lane)	120,000

The allowable load limits on this route are the interprovincial RTAC (Roads and Transportation Association of Canada) truck weight standards which were adopted in 1988. These regulations allow the following maximums:

Steering Axle	12,100 lbs.
Dual Single Axle	20,000 lbs.
Tandem Axle Group	37,400 lbs.
Tridem Axle Group	52,800 lbs.
Gross Vehicle Weight	138,000 lbs.

PROJECT SELECTION

This site on PTH 1 had initially been identified in mid 1988 as a potential GPS-6B site. A September nomination to SHRP proposed 4 cells; the variables being a thin and thick asphalt concrete overlay, and a fine and coarse grained subgrade. This site was considered desirable because the four cells could be placed within a one-mile length, requiring only one set of traffic data collection equipment, and was being given high consideration for rehabilitation in 1989. The North Central Region Contractor reviewed our plans on November 22, 1988 and accepted the four cells subject to auger verification. The plans indicated that the site was constructed with a continuous low fill embankment and did not contain any thru-grade culverts or bridges.

On November 24, 1989 a meeting was held with the Department's Senior Management to consider SHRP's request for each State and Province to declare its desire to participate in the SPS experiments. The scope of each project and the projected Department commitment was reviewed. The meeting concluded with the decision to inform SHRP that we would consider participating in either SPS-1 or SPS-2, either SPS-3 or 4, and either SPS-5 or 6. This commitment would be subject to available sites and the final experiment designs.

The instant approval to a request to send a delegate to attend the SPS-5 and 6 design workshops in Washington, D.C. at the end of February, 1989 was a further manifestation that our Senior Management was committed to SPS. Immediately after that workshop, we analyzed the feasibility of substituting the 2 cells of the proposed GPS-6B on the "fine" grained subgrade with a full fledged SPS-5 experiment. In effect we were upgrading the experiment from a 4 cell rehab experiment, the GPS-6B, to a 11 cell rehab experiment, 2 cells on the GPS-6B, as shown on Figure 2, and 9 cells on the SPS-5, as shown on Figure 3. This plan was presented to Senior Management on March 9th. At this meeting, the plan was approved and Construction and District staff and resources were committed to develop and manage the rehabilitation contract.

A major problem at this site was that the "fine" grained subgrade segment was only 6,500 feet long. This was sufficient length to place 9 sections, an approach, limited transitions, and a follow-out section, but this limited length has subsequently presented the following problems:

1. It prevented the insertion of a tenth section which SHRP requested subsequent to the April 89 Design & Plan. That section would have been constructed with the local agency's conventional rehab technique.

2. It prevented the exclusion of a section which had a skin patch on the traffic lane only. This patch was removed during construction because it was within the milled portion of the experiment, but it would have been more desirable to have avoided this section.

3. It created minimum space for extracting post-construction overlay thickness determination cores at the thickness change transitions; i.e. the transitions between the thin and thick overlays.

In spite of the relatively short section length, it was decided to proceed with this site, primarily because this was the only asphalt concrete section which would be rehabilitated in the foreseeable future which met the SPS-5 criteria; i.e. "fine" grained subgrade, was 18 years or less in age, was in its first structure life cycle, although it had received a chip seal coat, had a homogeneous traffic pattern for its full length, and was perceived to have more than the minimum required ESALS. A formal nomination was submitted to the Executive Director of SHRP on April 6, 1989 with a proposed test section layout, stating that the site was within a project which had been approved for an asphalt overlay this summer and that a contract would be awarded no later than the end of June. SHRP was verbally informed that we were proceeding with project design and contract development, and that they had less than 2 months to determine the suitability of this site.

PRE-CONSTRUCTION TESTING

The following table lists the testing conducted on SPS-5 section prior to the rehabilitation work:

Date(s)	Test Type or Activity	Equipment Type	Agency
May 17&19,1989	Site Marking & Verification	Manual	SHRP(BPT)
	Coring	Core Van	MHT
	Augering	B-30 Mobile Drill Truck	MHT
May 29,1989	Deflection Testing(1)	Benkelman Beam	MHT
June 28,1989	Distress Condition(3)	Pasco Unit	SHRP
July 3&4,1989	Profile Measuring(2)	Dipstick	MHT(Rooke)
July 3-6,1989	Deflection Testing	FWD	SHRP(BPT)
Aug.4&5,1989	Profile Measuring(3)	Profilometer Unit	SHRP(PMS)
Aug.8&9,1989	Sampling: Cores, Test Pit, and mini test pits	Core Van B-61 Mobile Drill Unit, & Back-Hoe	MHT(BPT)
Aug.15,1989	Skid Testing(3)	ASTM Skid Trailer	MHT (Sask HT)

Notes:
(1) All sections tested in accordance to C-SHRP criteria.

(2) Five sections were tested. These 5 sections are duplicate sections for the C-SHRP (Canadian) program and will be monitored to meet C-SHRP requirements.

(3) Traffic Control was not required for these activities. All other activities required the closure of the traffic lane.

CONTRACT SPECIFICATIONS

The objective throughout the planning and development of the contract specifications was to use local materials and design procedures and to use the FHWA technical advisory T5040.27, "Asphalt Concrete Mix Design and Field Control" as a guide. This was in line with the SHRP recommendation to simulate normal practice and experience as close as possible in spite of the constraints which a test road imposes on production.

The lay-out of the SPS-5 section was designed to minimize plant mix changes by placing all the RAP sections on one end and the Virgin Asphalt sections on the other end with the two GPS-6B sections.

The thick overlay section will consist of 4 lifts in the milled area and 3 lifts in the unmilled area. The surface course will be 2 1/2 inches in the thin unmilled sections, to provide an additional 1/2 inch for levelling, and will be two inches deep on the milled and thick sections and will be placed in one continuous lift for the full length of the test road.

For the most part we will be able to meet the FHWA technical advisory guidelines, but will have some deviations with the specifications for the asphalt concrete aggregates. These deviations are:

1. The Dept. does not specify minimum sand equivalent or sulfate soundness standards. These tests will not be conducted as part of the quality control process because the testing equipment is not available.

2. The Dept. specification for crushed aggregates is that at least 50 percent of the particles shall have at least one fractured face. This is less than the recommended 60 percent with at least two mechanically induced fractured faces. Our contractor will produce aggregates to satisfy our specification, but the percentage of aggregate particles with two fractured faces will be determined.

CONTRACT DEVELOPMENT

The 10,000 foot long test road is situated on the east end of a 14.6 mile long, 2 lane asphalt concrete overlay project. The desirable form of contract would have been to tender the work under one contract, the regular 2 lift overlay of 12.7 miles as Part A, and the 1.9 mile test road as Part B; each part with separate unit prices. We also could have included a provision which would allow the Department to override Part B and revert the 1.9 mile section to the conditions of Part A if the SPS-5 section was rejected prior to the commencement of construction.

The Director of Construction opted for 2 separate Contracts because he did not want to limit the bids to the contractors who had asphalt recycling capability. Manitoba has had very limited recycling experience because most of our rehabilitation projects require significant strengthening. Therefore the majority of our projects which of 2 to 3 lifts of asphalt overlays, without milling or recycling.

The 12.7 mile, main section contract was advertised on June 24th, 1989, closed on July 6th, with 30 working days. Working day assessment to commence on July 31.

The 1.9 mile, Test Road, contract was advertised on July 8th, closed on July 20th, with twenty working days. Assessment of working days to commence on August 21st.

The supply and production of aggregate for the Test Road Contract was included with the Main Section Contract to minimize crusher mobilization costs.

To insure that the Test Road would be constructed in one construction season, which was SHRP's criteria, the contract contained the following clause. "In the event that the Contractor's asphalt mixing plant has not been set up and calibrated by September 11, 1989, work on the project will be deferred to the beginning of the 1990 construction season." This was considered to be a very safe date to insure completion prior to Oct. 15th, 1989. Our specifications will not allow placement of any surface course after October 15th, regardless of the weather at that time.

PRELIMINARY CONSTRUCTION ACTIVITIES

Fortunately the low bidder for the Test Road was the contractor who was awarded the contract for the Main Section. His statement immediately after the tenders were opened was that he would move on to the PTH 1 site about August 14th and complete both projects this season. The downside was that he did not have any recycling experience. With respect to the recycling situation, the contractor agreed to the following conditions: (1) that he would convert his Barber-Greene Drum Mix plant in accordance to a plan which was given to him by an asphalt equipment advisor prior to his bidding on this contract, and (2) that he would agree to mill extra material from the Main Section and that he would conduct a recycling trail section within the confines of the Main Section prior to commencing the Test Road.

Paving of the Main Section, and the milling of the Trial Section and the Test Road commenced on August 21st. The recycling trial is anticipated to occur about August 25th, and the paving of the Test Road is expected to commence about August 31st.

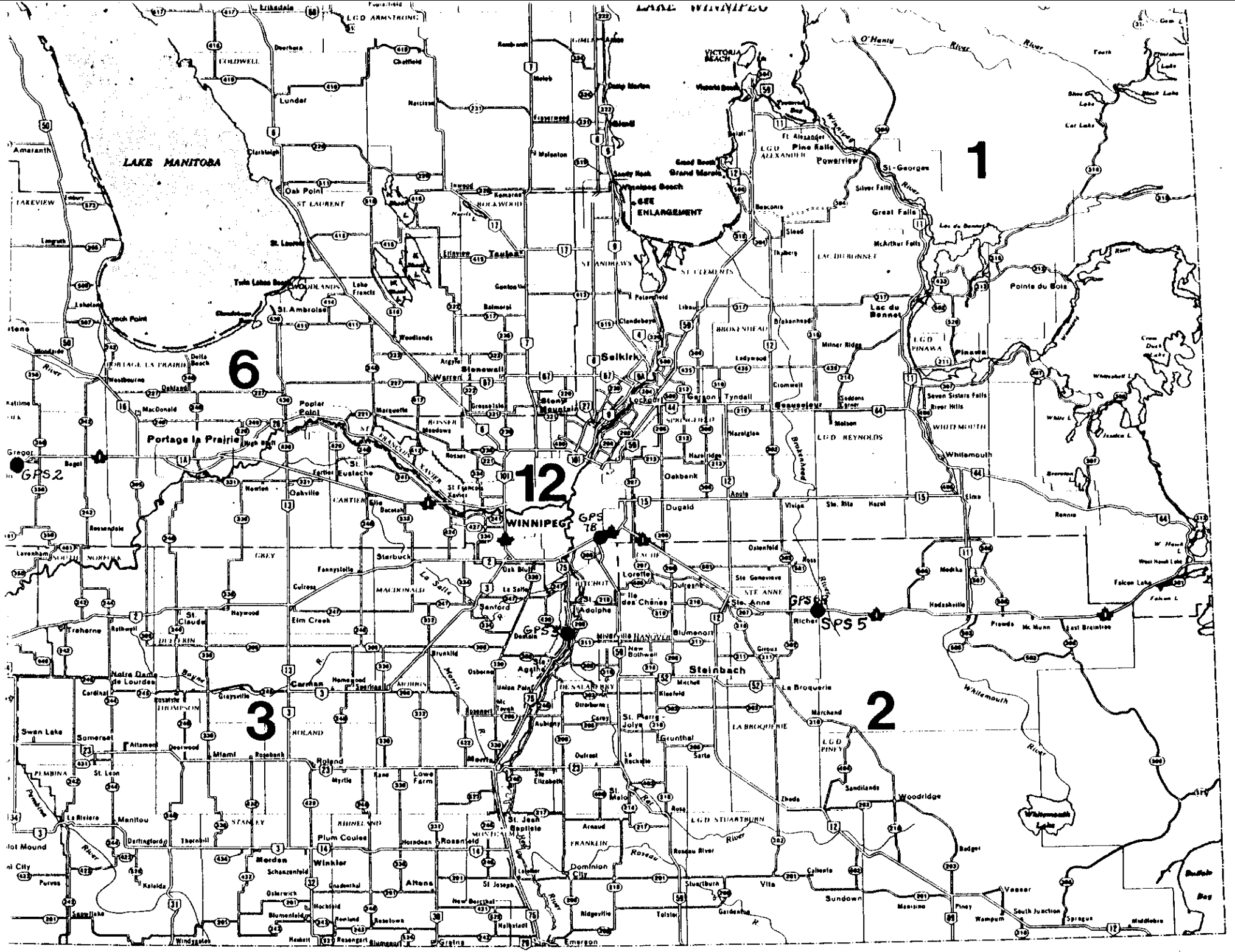
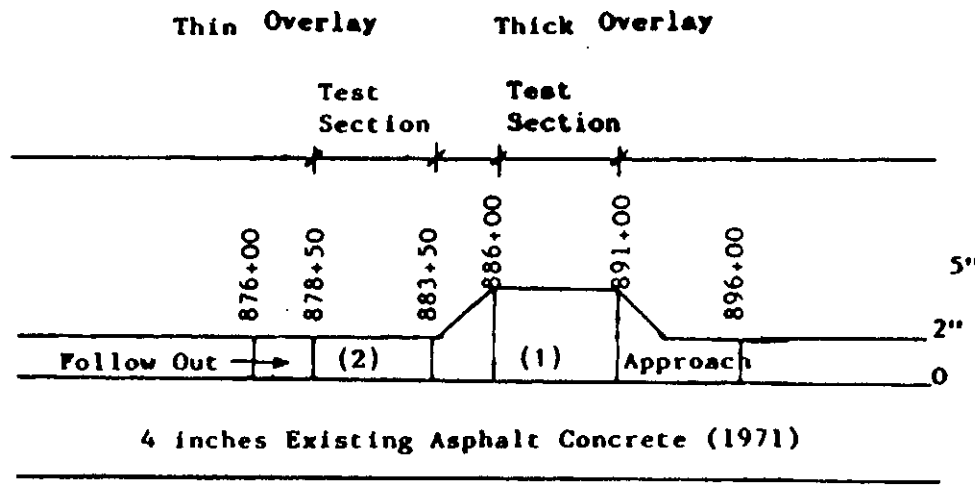

LAKE MANITOBA
LAKE WINNIPEG
1
2
3
6
12
GPS 2
GPS 5
GPS 7B
WINNIPEG
Portage la Prairie
Selkirk
Steinbach
Winkler
Morden
Carman
Brandon
SEE ENLARGEMENT
ONTARIO
NORTH DAKOTA
MINNESOTA

FIGURE 1

PROVINCE OF MANITOBA

GPS - 6B

TEST SECTION LAYOUT



	Length (Ft)
Approach	500
Test Section	500
Beyond Test Section	250
Total Monitoring Section	2,000

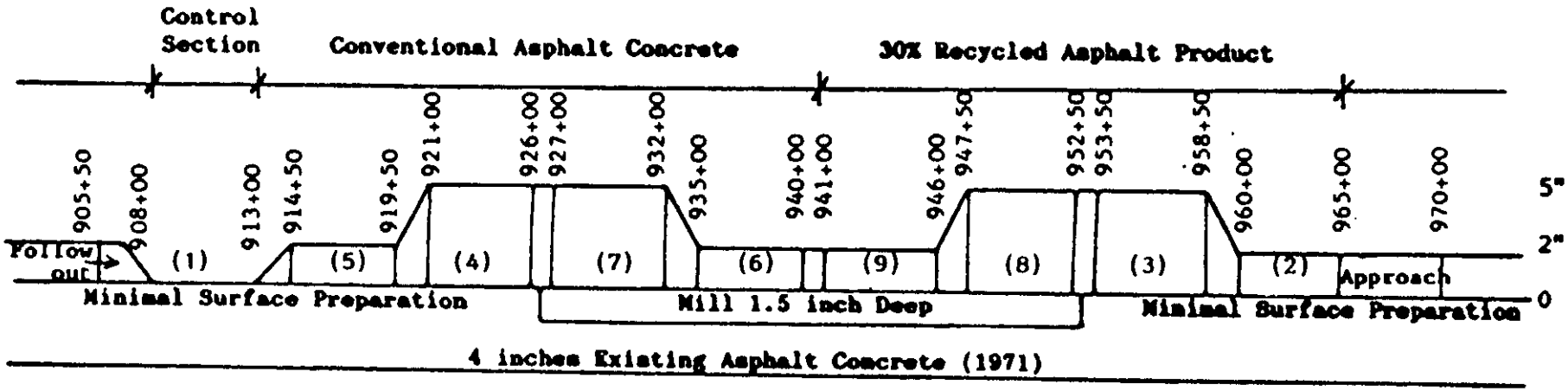
SHRP IDENTIFICATION NUMBERS:
836450 - 836451

FIGURE 2

PROVINCE OF MANITOBA

SPS - 5

TEST SECTION LAYOUT



	Length (ft)
Test Sections	500
Level Transition	100
Thickness Change Transition	150
Total Test Section	6,450

SHRP IDENTIFICATION NUMBERS:
830501 - 830509

Note: Section Numbers indicated in brackets.

FIGURE 3

Manitoba SPS-5 Location of test sections / time									
Activity	Initial Pictures		Initial Video		Pre-const. Fwd	Const. 7/27	D&S	Post-const. Fwd	Present Map
Person	Luke		Luke		Guy	Const.	Ron	Guy	
Date	5/19/89		5/19/89		6/89	~~7/89~~	8/89	10/89	3/15/93
Section number East To West By Station	830509	913-908	*	908-913	830501	7/89	830501	830502	830502
	*	914+50-919+50	*	914+50-919+50	830502	7/89	830504	830503	830503
	830503	926-921	830508	926-921	830507	7/89	830505	830508	830508
	830506	932-927	830509	932-927	830508	7/89	830509	830509	830509
	830505	940-935	830506	940-935	830505	7/89	830508	830506	830506
	830508	946-941	830507	946-941	830506	7/89	830506	830507	830507
	830507	947+50-952+50	830504	947+50-952+50	830503	7/89	830507	830504	830504
	*	958+50-953+50	830505	958+50-953+50	830504	7/89	830503	830505	830505
	830501	965-960	830502	965-960	830509	7/89	830502	830501	830501

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May 26, 1989

MEMO TO: Richard Ingberg

FROM: Erland Lukanen

RE: SPS-5 in Manitoba

The sections for the SPS-5 site on Highway 1 near Brokenhead River in Manitoba (about 1 hours drive east of downtown Winnipeg) were identified, laid out and marked on May 16, 17 and 19, 1989. Sketches showing the location of the site and section are attached.

The sections within the site that was selected by Manitoba were tentatively located on plan sheets by Ray Van Cauwenberghe and Leonnie Kavanagh prior to locating the sections in the field. The sections were identified by the numbering system used during the meeting in Washington attended by Ray regarding SPS-5 and 6. (The numbering system used turned out to be a problem which will be described later.) Also, in addition, Ray had a survey crew paint imperial station marks on the edge of the pavement throughout the length of the site proposed for SPS-5 which was very helpful. The overall length of the site available was approximately 5,500 feet. Within that length the 8 sections plus control section and transition zones had to be placed. Fortunately, the entire length of the site was a relatively consistent shallow fill and there were no culverts or any other discontinuities within the site that took up room.

On Tuesday afternoon Ray, Leonnie and I drove out to the site and reviewed the section locations as selected from the plan sheets. Several of the sections were shifted slightly to place a gravel road entrance into a transition zone between sections.

The site is on a 4-lane divided highway with approximately 100 feet from centerline to centerline (the plans may be checked for the exact distance). The site chosen is in the westbound roadway and begins approximately 500 feet west of the bridge over the Brokenhead River. This bridge exists in the westbound lane only and is the only identifiable geographical feature near the site. The terrain is a relatively flat sandy outwash. The soils in the site are sandy silts. It is just east of the beach of glacial Lake Agassiz. The westbound roadway consists of an asphalt surface approximately 4 to 5 inches thick over a granular base on sandy silt subgrade soil. The shoulders are gravel,

approximately 4 feet wide on the inside and 9 feet wide on the outside. The bituminous pavement in the outside lane extends approximately 1 foot beyond the edge stripe. The cross-section throughout the site is a constant cross-fall from left to right across both lanes. This roadway does not have a crown at centerline.

The surface of the pavement has periodic medium to high severity transverse cracks at 50 feet to 100 foot intervals. Also, there are several locations in the center of the site where a blade laid skin patch has been placed in the driving lane only. The skin patch is a cold mix material, relatively thin, and appears to have been placed to correct rutting. All of the intensive maintenance sections or milling sections for SPS-5 have been located in the areas where the skin patches have been placed. It should be noted that the RAP from the skin patches will not be used because of the cold mix skin patch material. The only significant feature within the entire site is a gravel road that enters at approximately the middle of the site.

The sections were not laid out in the same order that was identified in the handout at the March SPS conference in Washington or the April 1989 write-up on SPS-5. The section order was rearranged for the following reasons:

- All of the milling sections were placed adjacent to each other in the area of the site that has the cold mix skin patches.

- The sections were arranged to allow all of the recycle sections to be adjacent to one another. The reasoning behind this was that good quality control for recycling is a primary concern and once the production of recycled material begins, the intent is to pave all of the recycled sections in consecutive order, thereby eliminating delays in either the plant or lay down operation.

The desired subgrade soils for an SPS experiment are fine-grained soils. The soils within the site have been classified in a 1970's soil survey as A-4 sandy silts. Four auger borings were taken throughout the site at the following stationings:

Station	965+60
	959+40
	934+50
	907+50

All of the boring sites show sandy silt materials. Visually the first boring location was sandier or less silty than the other boring locations. The subgrade materials varied in color from location to location and within the individual boring locations. The soil colors were brown, orange and gray. Small bag samples

were taken at each of the boring locations for further evaluation in the lab. A copy of the lab results is attached.

The sites were marked with temporary marking tape and the numbers were stenciled the morning of May 17th after the auger borings were completed. Rain caused the operation to stop at about noon before all of the marking tape and stencilling was completed. We returned to the site again Friday morning, May 19th, and completed the marking, stencilling, and video taping of all the sections except for the control section before rain set in again. Still photos were taken from the car window because of the rain at each station mark throughout the site. A GPS level surface condition survey was not accomplished at the time due to the rain. However, it is anticipated that the PASCO unit will be able to photograph the pavement during their scheduled trip to Manitoba in June.

The numbering system selected by Ray was based on the handouts at the SPS meetings in Washington in March. During the week of June 15th an SPS-6 site was also being laid out in Iowa. Both sites used a numbering system identified in the March meetings in Washington. However, a discrepancy arose in the SPS-5 write-up dated April, 1989. A similar document for SPS-6 was also written in April. The numbering system in the April document for SPS-6 did not change from the layout described in March, nor did the order of the numbers differ from the factorial matrix contained in that document. However, for SPS-5 the numbering system identified in the April document did change from the handouts used in March. Also, the section location diagram on page 9 of the March handout was in a different order than in SPS-5 factorial. The April publication maintained the same relative order for the 8 SPS-5 sections; however, the numbering system was adjusted to allow for a control section as number 1 before the SPS-5 sections. Manitoba selected section number 9 to be the control section; therefore, if we were to conform with the April publication, section 9 should be re-numbered section 1 and all of the other sections should be increased by 1. For instance, section 1 will become section 2, section 2 will become section 3, etc., and finally section 8 will become section 9. This would make the basis of numbering for SPS-5 in agreement with the April publication and also in agreement with the methodology used for SPS-6.

There still, however, remains a difference in the ordering of section numbers between the highway layout diagram and the order of the rows in the experiment factorial chart. If this is considered to be important, the highway diagram numbering system should be rearranged to agree with the factorial chart. If not, we can make the adjustments described above to maintain continuity of section numbering of SPS sections between various experiments. This is relatively important since, I believe, the intent is that the same numbering system be used throughout the

country so that SPS-5 section 8 in Manitoba will be the same treatment as a section 8, for instance, in any other agency.

If the ordering of section numbers as identified in the actual factorial diagram is important, then the numbering of the sections in SPS-5 should be changed accordingly. This would also require an update of the April, 1989 write-up on SPS-5. A copy of the factorial and section diagram with adjusted numbers is attached.

Because of the wide application of the SPS, consistency, at least within the numbering system, is important to avoid confusion at later dates. One can imagine a poor researcher in the future trying to compare the results of all of the section 8's of the SPS-5 throughout the country. If section 8 is not always the same treatment, this would result in the possible loss of time and confusion.

The section numbering system used for SPS-5 is the same as used in Iowa for SPS-6. Therefore, for each section we used a 6 digit identifying number with the left two digits identifying the agency, which is 83 for Manitoba. The third digit from the left was assigned 0 to indicate hat the section is an SPS section. The fourth digit from the left was assigned a 5 to designate SPS-5 and the last two digits are the section number. In this case we used 830501 through 830509 to identify the 9 sections in Manitoba. This numbering system will work fine throughout the country if SPS develops as described in the write-ups. A difficulty, however, will occur if one agency gets two sites within the same SPS experiment. For instance, if Manitoba develops a second SPS-5 site, the same numbering system could not be used exactly as described. An alternative may be to use the next decade in the numbering system starting with 830511 and proceed through 830519. We need to check to see if any of the SPS experiments involve more than 10 sections. If so, we will have to skip to the next decade in the numbering systems for a second site, such as 830521 through 830529. This numbering system, I believe, will handle all the SPS sites throughout the country.

Drilling and Sampling

The questions of how to conduct the drilling and sampling in the site must be answered. There are actually two issues:

1. Where should the samples be taken?

2. If a full set of samples is not taken for each SPS section, how is the data for that section handed? Should the data base reference a representative test, contain the data from a representative test, or contain data from a representative test and be flagged as such?

The sources for variation in this site seem to be:

1. Variation in thickness of the HMA and granular base.

2. Variation in subgrade soil.

We do not expect much variation in the properties of the HMA or granular base throughout the site. Therefore, we recommend that a full set of HMA and granular base be taken at these locations:

Station 959+40
Station 934+40
Station 906+40

and the thickness of the HMA and granular base plus subgrade soil samples be taken at each transition location.

All of the above sampling should be completed before the actual construction to minimize the disruption of the new overlay. Cores of the overlay would be taken in the transition areas after construction. Because of the short transitions available, we must take care to get representative thicknesses and materials.

The attached sketch shows how sampling zones reduce the length of the effective area left to accomplish a transition.

Pavement Condition

The pavement condition is to be determined by the agency. Ray considers the site to be in POOR condition. The April 1989 write-up on SPS-5 states "...it is desirable that some type of a composite distress index be used by highway agencies to classify pavement condition..." This would just be a matter of getting the historic ratings on that section and a definition of the rating process.

Climate Zone

Manitoba is assigned to be in the dry-freeze zone. This site in eastern Manitoba may be in the wet-freeze zone. A check of local climatological data should be made to verify what zone the site is in.